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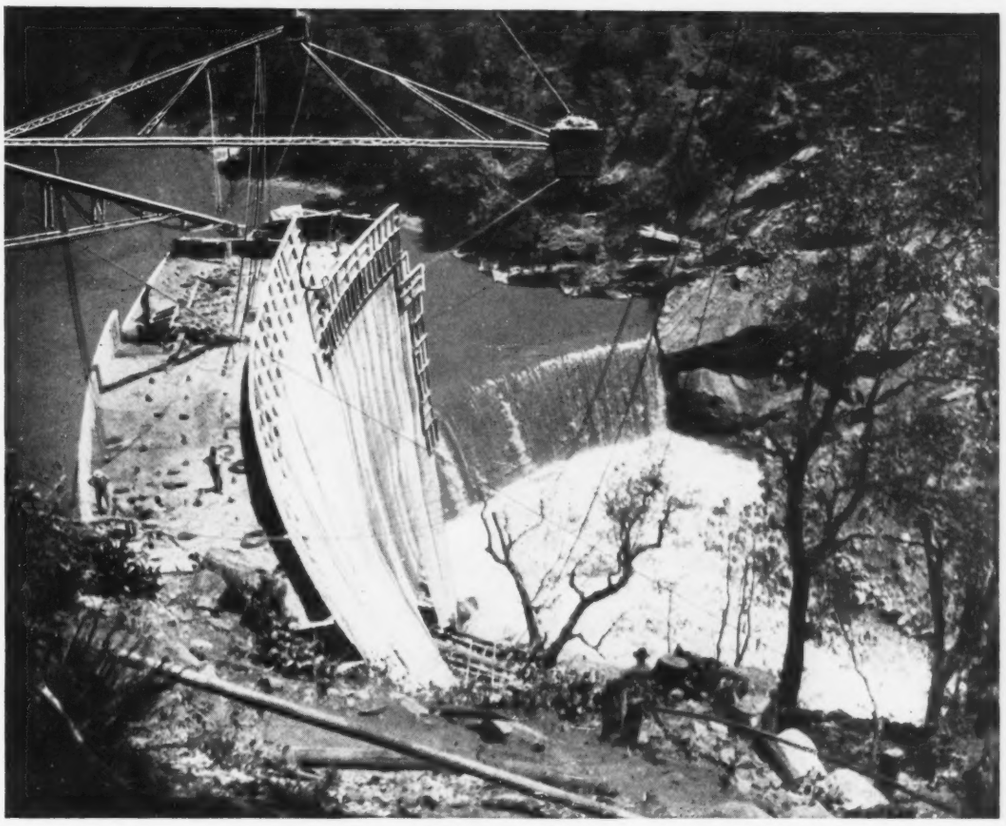

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July 28, 1923

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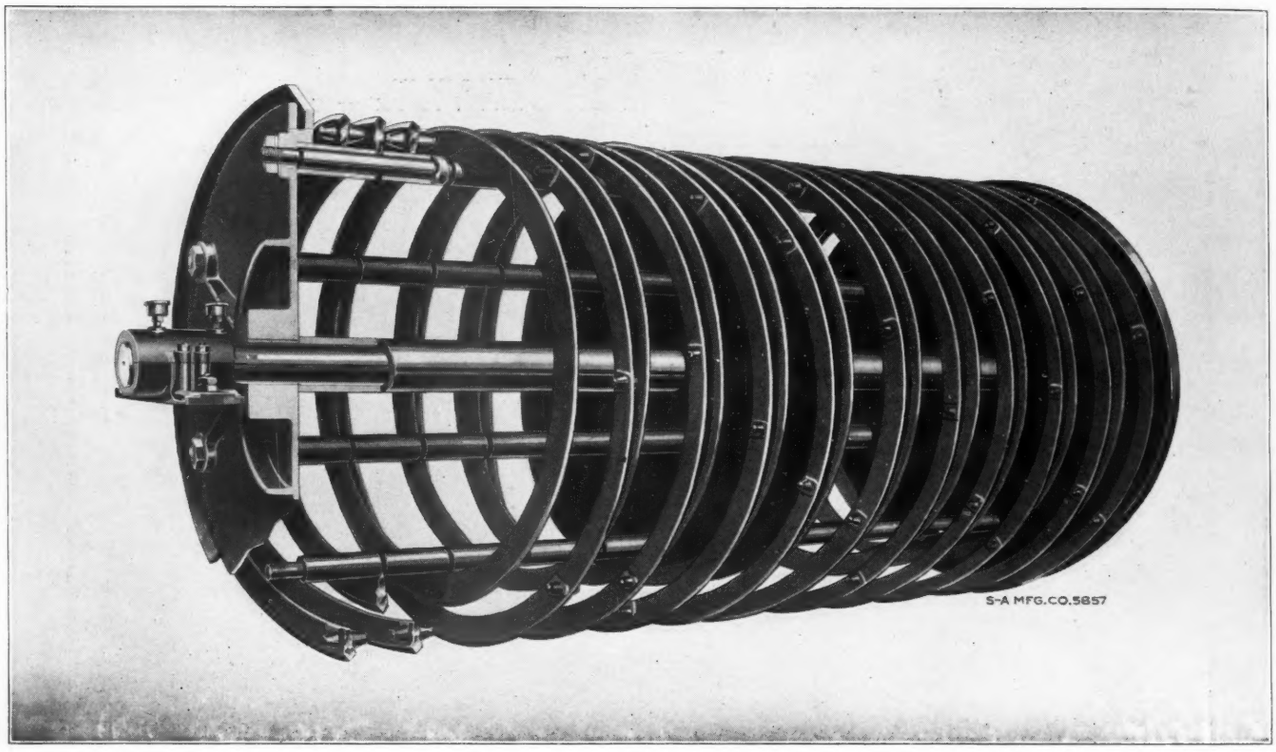

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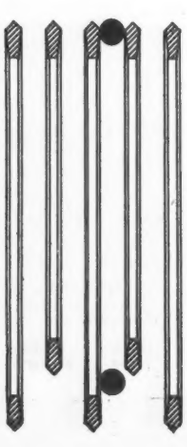

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ENGINEERING & MINING
JOURNAL-PRESS
JOSIAH EDWARD SPURR, Editor

Volume 116 | New York, July 28, 1923 | *Number* 4

Waiting

"CONDITIONS are improving in Mexico, and I am securing some property and will be all ready for the rush that is coming." "Russia is coming around all right; we are marking time and waiting till our mines are restored to us." "We have titles to some valuable prospects in Central America, which will put us all on Easy Street as soon as a railroad is run through the country. We understand that the concessionnaires for the railroad are making preliminary surveys." "I have laid in a good line of stocks and I am going to unload them when the next upswing comes."

Foresight, we are told, is the secret of success. At the close of the Franco-Prussian War, in 1870, one of the Rothschilds is said to have counseled a friend to buy francs, which were low. Against his better judgment, he did so, and the marvelous recuperant power of the French nation directly brought the franc to par, proving the wisdom and foresight of the great bankers. At the close of the World War, bankers recalled this advice and imparted it generously, and those who had the long foresight and the willingness to wait, are still waiting, after five years, for a symptom of recuperation in the franc. Those who applied the evident analogy to the mark have ceased waiting, and are at rest.

All this raises the question whether great financial successes, in mining and otherwise, are usually due to foresight and vision, or whether they are not. The man successful in his venture can and will point to his foresight and wisdom and encourage the young man to be as wise and great as he has been. The discoverer of a certain great mining camp, who stumbled upon an outcrop by the sheerest accident, used to relate in after years how he had mathematically calculated the exact position where a new camp should be found, and voyaged thither, and behold—there it was! But the thousand and one fruitless vigils over seeds of enterprise that refuse to grow are never celebrated by the watchers in the self-glorifying magazine articles. We recall a prospector who had spent twenty years in driving a tunnel alone. He informed us that the ore was about ten feet further on. He was old and poor; and to the casual eye there was no likelihood of his striking ore in ten feet, or anywhere.

All in all, we cannot but approve of the theory of custom smelter management which sells as much copper as it buys, week by week, rather than the practice which accumulates stocks in the endeavor to sell for a higher price than it paid. And it is a question whether the same principle will not apply to mining—whether it is not best from a business standpoint to discount our foresight, acknowledge that the chances are that we really cannot divine future events and circumstances, do what business and extract what profits we can and where we can; and balance the ledger of profit and loss, hopes and fears, at the end of a definite period, and write it all off for a fresh start.

Criticism of "Blue-sky" Laws

THE GOVERNORS of the Western Division of the American Mining Congress at their recent meeting in San Francisco severely criticised "blue-sky" laws and passed, among other resolutions, one calling for a revision of the existing "blue-sky" legislation and condemning federal legislation proposed for the purpose of strengthening the various state laws controlling the marketing of securities.

The resolution states "a large part of the decline in western metal mining is due to unfair restrictions of so-called 'blue-sky' laws, which have in many directions rendered the raising of capital for mining and other speculative ventures almost impossible, thus decreasing the production of metals and contributing thereby to the cost of all construction and manufacturing and tending to eliminate the prospector and small operator from important participation in and contribution to the prosperity of the mining industry, and therefore of the entire West. . . . "

We quote the foregoing extract from the resolution in question, as it shows how western mining men are often misled by superficial reasoning. It is true that a comparison of statistics indicates a falling off in mineral production following the war period. This was the result of economic conditions, low metal prices, and an accumulation of metal stocks. During the war period there was a curtailment of development and for a time an acceleration of production. Curtailment of gold mining was the result of economic conditions, the inflation of currency. Stagnation of industry affected mining as well as other industries. The revival of industry has likewise revived mining, and mining is now on the upward grade.

The dominating cause of the fluctuations in the prosperity of the mining industry is economic. "Blue-sky" laws have little effect. It is true that we may expect a gradual falling off in mineral production as the larger mines approach exhaustion. The rate of mining discovery and development is necessarily irregular. It is more difficult to discover a profitable mine than it once was. A greater amount of capital is necessary for individual prospecting operations, and there will be no doubt a considerable proportion of failures as compared to successes.

The great industrial expansion of the western mining states is not appreciated by mining men, nor do they consider that this expansion necessarily implies that the capital which was once available for mining and prospecting is now in great demand by other industries which offer the small investor less speculative enterprises. Many of the western states have built up a heavy bonded indebtedness by absorbing capital from every source. The automobile has taken a tremendous amount of small capital. Taxes have accounted for a large part of the capital which once took speculative chances in mining. The rich man must pay a large part of his income in income taxes. In a word, where

formerly the miner occupied a front seat in the theater of speculative enterprises, he now finds, to his embarrassment, that he is one of the gallery gods. We do not appreciate how bonds, farms, manufacturing, automobiles, and taxes have absorbed capital and left lean pickings for the prospector and mining promoter. The oil industry has been very popular. It has taken more than its just share and has been responsible for a great deal of fraud and chicanery.

It is difficult to raise capital for small mining enterprises, but the "blue-sky" laws are a minor factor in the situation and in our judgment are more of an advantage than a disadvantage. Mining suffers from the operations of dishonest promoters; most of them have gone into the momentarily bigger field of the oil industry. Both the mining and oil industries will benefit by restricting within legal bounds the operations of these gentry.

On the whole, anything which will give the small investor a square deal in mining—and this is what the "blue-sky" laws are doing fairly well—should be encouraged by mining men. No doubt the "blue-sky" laws can be improved, but, as they are, they are playing an important function. Recently, one of our engineer friends stated that in the case of operations in the Randsburg district of California the "blue-sky" laws delayed the securing of capital for about six months, but they did not prevent sufficient capital from being secured and used in the exploration of that district. In his opinion the district will be thoroughly explored and whatever money is lost will be lost by those amply able to lose it. This is a better outcome than could have been secured under the old methods.

We believe that "blue-sky" laws are here to stay and that mining men should get behind the men who are enforcing these laws and do their share in keeping mining a clean and legitimate field for speculation and investment. The American Mining Congress must clean its eye-glasses and take another look at the "blue-sky" situation. In our opinion it has been seriously misled and has not earnestly studied its economics, nor has it dug deeply enough into the facts.

How Scarce Coal Helps the Copper Industry

EXPENSIVE COAL, and labor troubles in the coal fields, are, in a way, benefiting the copper industry. This statement may seem hard to believe by the mining and smelting companies that have to buy fuel, but the explanation lies in the fact that many transportation systems throughout the world are being electrified. Water-power can in this way be utilized, and even where sufficient water-power is not available it must be remembered that coal can be burned more efficiently in a stationary boiler supplying steam to turbo-generators than is possible in locomotives. Then, too, there is the saving from regenerative braking in mountainous regions. Electrification of a railroad is expensive in the first place, but subsequent operation is cheaper.

Recently announcement was made that the Virginian Railway will electrify 213 miles of its track lying between Roanoke, Va., and Mullens, W. Va., this being the part that crosses the Allegheny Mountains. The undertaking will involve the expenditure of $15,000,000, and the contract, which has been awarded to Westinghouse, is said to be the largest similar contract ever placed. The electric locomotives that it is planned to use will develop 20,000 hp. per train, and will haul 9,000-ton trains over the mountains at a rate of fourteen miles per hour. Three immense steam locomotives, each with twenty driving wheels, are now required to haul 5,500-ton trains at seven miles per hour.

It would be interesting to know just how much copper is to be required for this project. Certainly no small amount will be taken in the next few years by this and similar enterprises. Contracts have already been awarded for further electrification of the Pennsylvania, Long Island, New Haven, and Norfolk & Western roads, and for the Chilean railroad, in South America. In France, Switzerland, and Italy similar work is being done. Electricity is displacing steam: copper and aluminum are displacing coal.

Lotteries, Sweepstakes, Mines and Oil Wells

THE LEGALIZED GAME of chance in many countries, the state lottery, could not survive if exact information were not available to participants as to the proportion of prizes to blanks. To raise money for charitable purposes and for the upkeep of hospitals it has proved successful in South America; but continued support is forthcoming only because of the number of prizes distributed and the relatively large proportion of the money collected that is used for this purpose.

One must be stupid to buy a "pig in a poke," as the saying goes, which is precisely what many unthinking persons do when subscribing to a sweepstake lottery in connection with which no information is given other than the amounts to be paid in the form of a few large prizes. Recently we were shown sweepstake tickets that apparently are on sale in this country at regular intervals. No mention was made as to the proportion of prizes to blanks. One's chance of winning something, after having invested in a ticket, might be exactly one in ten million. The few prizes mentioned were to be distributed according to the result of a horse race; and the profits, it was alleged, went to the upkeep of a hospital in Ireland. Such a scheme offers so remote a possibility of return that additional reasons crystallize in the mind of the general public against any and every similar game of chance.

However, purchasers of Irish sweepstake tickets are not the only willing victims. How many investors of money in mining and oil stock realize the importance of determining the ratio of possible prizes to probable blanks? In other words, what is the capitalization of the company seeking funds, and what is its actual or probable income and profit from operations? Does the $1,000 or so to be invested represent the proverbial "drop in the bucket," or is it an appreciable proportion of the total amount to be raised? How much of the mine or the oil well is the investor buying with his cash? Unless he can determine this with approximate accuracy he would do well to seek for some other form of investment.

Taking a flyer is exhilarating and not to be despised as a method of increasing the spirit of optimism; but a fair deal is essential to preserve interest and prevent fruitless repining.

Mine Promotion

IT MAY SHOCK some to suggest that a course in mine promotion might well be included in a mining school curriculum. But why not? Promotion of an enterprise is quite as essential as proper engineering and must usually be considered first. Projects of possible merit are frequently presented in so crude a manner as to discredit them in the eyes of the well-informed, oftentimes giving the impression that they are fraudulent when in reality they are not. This is because the engineer rarely is consulted in getting out the promotion literature, though it may be based upon his report.

In South Dakota there is a prospect, the office of which is in New Hampshire. The property may have merit and its owners may be honest, but much of the company's prospectus reads like bunk. It is pictured as a second Homestake and over 10,000,000 tons of ore at 800 ft. is delicately suggested, as well as a selling value of two and a half million within a year. No engineer would have approved of such a statement.

The engineer would do well to take off his halo of professional sanctity occasionally and try to make the public think he is a business man. The more he knows of promotion and finance the better able he will be to get away with it, and the more likely he will be to be given charge of the promotion of an enterprise as well as of its development. When Secretary Work recently removed an experienced engineer as head of the Reclamation Service, he said he wanted a business man for the place. Ignoring the insincerity of his statement, it is lamentable that there should be a distinction in the public mind between engineer and business man. The Secretary took advantage of this in framing his plausible excuse.

Fundamentals in Milling

METALLURGISTS AND MILLMEN sometimes neglect to consider the results that will follow in their plants where a change in the physical condition in an ore occurs after a plant has been in operation for some time. Difficulties have arisen in plant work due to a variation of an ore in chemical composition. The change from oxidized to a sulphide ore is often provided for in the mill arrangements. Mining men from long experience have learned to look for this condition. But they have not learned in all instances the fact that a change from dry ore to wet ore, or a change from a siliceous ore to one charged with clayey material, may prove as embarrassing as a change from oxidized to sulphide where adequate provision in milling arrangements has not been made.

A dry-crushing plant may function perfectly as long as it receives dry ore, but it may prove a lamentable failure when wet, soggy ore is forthcoming from the mine. No matter how successfully the treatment process may be, the wet ore cannot get by the dry-crushing plant. Similarly a very clayey ore may appear to be amenable when it is thoroughly dry, but when wet it may clog the ore chutes, stick in the cars, refuse to be fed, and altogether cause an unthinkable amount of grief. A small-tonnage plant can often compensate for wide variations in the physical condition of an ore, but a large plant is quite another matter. For the large plant every possible variation in the physical nature of the ore supply must be given consideration.

Colorado millmen long ago worked out an excellent arrangement for the control of dust in dry-crushing plants, but in two dry-crushing plants which we recently looked over we noted to our surprise that no provisions had been made for dust control. Both were large plants and both had been designed by experienced millmen. The mechanical arrangements were good. In one case spraying the ore would have reduced the dust to a minimum without interfering with the crushing. In the other case wetting would have been fatal, and a dust-gathering installation was essential.

Apparently, the experience of one decade can be forgotten in the next and must be rediscovered where similar difficulties arise. Such a condition arises usually because of the operators' failure to consider the limiting fundamentals in ore treatment. We venture to place these thus: In all dry-crushing installations dust will become a nuisance unless special provision is made to allay or remove it. Certain kinds of ore can be sprayed with water, but most ores require the housing of crushing machines and the maintenance of a low vacuum within the housing, or both spraying and vacuum. Wet ores are best crushed wet. Wet sticky ores can be wet crushed or washed to first remove the clayey constituent. Where wet crushing is undesirable, drying before crushing is necessary.

The Astute Mr. Gompers

EVIDENTLY, Mr. Gompers will not let Mr. Gary get away with any credit at all for abolishing the twelve-hour day in the steel industry if he can help it. No sooner had the steel men promised definitely to begin the work of changing to an eight-hour day within a short time than the American Federation of Labor began a new drive to unionize the 375,000 men in the industry. In announcing the plan Mr. Gompers said that the psychological time for organizing the steel workers had arrived and that a drive for the eight-hour day would feature the movement. He probably feels that it will never do for the workers to think that they can better their condition save through their union leaders. Even the millions spent on welfare work are pointed out by the leaders as the result of coercion and fear of the unions.

Almost at the same time Mr. Gompers attacked the recent report of the President's Coal Commission. "Real penalties for the miners, phantom penalties for the operators," he said. Evidently he is hard to satisfy.

Recent Bucket-Shop Legislation

THE BUCKET SHOP is a scheme for evading the gambling laws. In place of cards, faro, and the roulette wheel, recourse is had to the prices of industrial and mining stocks as a basis for placing bets. Professional gamblers as well as the unwary are "roped in" by the bucket shop. Recently a law was passed by the California Legislature which makes the practice of "bucketing" illegal and requires brokers to keep a full set of books. Brokers are now required to secure a license, and the new law, which is effective on Aug. 17, 1923, requires brokers to take out a surety bond of $5,000 after that date. It is believed that it will be effective in preventing the sale of questionable or worthless securities.

DISCUSSION

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief.

Mechanical Sampling of Ore

THE EDITOR:

Sir—In Alfred T. Fry's discussion (*Journal-Press*, June 16) of our paper on "Mechanical Sampling of Ore" there is one important point which especially needs explanation:

It was proper for C. H. White to approve the cut-and-try method, which he describes in the quotation given by Mr. Fry, because the better way had not then been found. His statement that "there are so many unknown quantities that a mathematical treatment of the subject does not yield results of a very practical character" refers to the same phase of the problem that we had in mind when saying "the facts that ore does not break in cubes, and that there is a large range of sizes at any stage of crushing, introduce complications in the mathematics"; and "because of the mixture of minerals in some pieces of coarse ore it is practically impossible to estimate the number of particles of the different minerals." Yet a mathematical analysis can be made of the facts that are found by our methods. It is the same kind of analysis by which the insurance tables, as to expectation of life and of accident, are calculated. These tables are the basis of the insurance business. The method is outlined on p. 282 of the *Journal-Press* of Aug. 12, 1922, and is described in somewhat fuller detail on p. 948 of the issue of Nov. 25, 1922. Results obtained in this way are entirely systematic; but those reached by the cut-and-try method are commonly quite unsystematic, as pointed out in the comment on mill *S* on p. 280 in the issue of Aug. 12, 1922.

Cut-and-try takes a long time to arrive at accurate results, especially because that method provides no means of knowing at which of the stages of sampling a change is necessary in order to make the final sample correct. The new method is both more expeditious and more accurate; and leaves no doubt as to the proper weight to be taken at any stage of crushing. We were startled to find that when the constants k and a had been derived for the ores with which we worked, calculations for the weight required at 0.004 in. (150 mesh) showed just such quantities as all experience proves to be right in order to yield accurate assays from pulp of that fineness. For example, in one case the finest ore on which tests were made had been crushed to pass a 0.2-in. hole; and calculation to 150 mesh indicated 0.72 gram as the proper weight. Chemists know, when pulp is prepared through 150 mesh, that from a half to one gram is a suitable weight for assay. Because of this fact any set of standards should show approximately this weight for this size.

One of the present writers was an assistant to Dr. Richards at the time he prepared the figures quoted by Mr. Fry, and we know that they were put forward not as a set of proved standards but merely as a suggestion. At that time it seemed as though a constant value was suitable for a in the general equation $W = kD^a$; but experience and further study have proved the contrary. As stated in the *Journal-Press* of March 24, "we did not assign values for the exponent a. The values were fixed by the qualities of the ores themselves, as determined by careful tests. So also were the values of the coefficient k.

	k	a	Grams for Assay at 0.004 Inch (150 Mesh)
Copper	600	2.32	0.72
Copper	700	2.37	0.62
Copper	2,100	2.48	1.0
Gold	576,000	2.90	27.7

"The variations prove that no constant value of a can be used for all ores. And the accuracy of the method is shown by the quantities which the tests indicate for assay of 150-mesh pulp, as given in the last column of the above tabulation."

The mathematical reason why a constant value of a is not allowable is seen by careful study of the fact that one gram is an approximately standard weight for all ores of base metals at 150 mesh (0.004 in.), or one assay ton for precious-metal ores. This being true, the only way to make the general formula show greater weight for a spotty ore than for a uniform ore, at say the 1-in. stage of crushing, is to have different values of a in the two cases. Using a fixed value for this exponent, and varying only k, makes the assay weight at 150 mesh proportional to k instead of leaving it, by warrant of long experience, approximately constant for each of the two great classes of ore—one gram for base metals and one assay ton for precious metals.

Neither Richards' figures, nor ours, nor those that have been published by D. W. Brunton can be applied directly to any class of ores, for no standards can give an operator means of knowing which series of figures suits his case. What is required is the scientifically exact method which we have worked out, and which practice has confirmed.

CHARLES D. DEMOND, Covina, Calif.
A. C. HALFERDAHL, Anyox, B. C.

Pay of Engineers

THE EDITOR:

Sir—I note with interest the short editorial in the issue of June 23, under the above heading, in which the writer concludes that the engineer might as well be resigned and quit kicking, or else "take his chance in some new or some related work, according as he thinks he has ability, or as opportunity presents itself."

A little further on, in the same issue, attention is drawn to the extract from the report of Mr. Pritchett to the Carnegie Institution and to "the crying need for pick and shovel men in the United States." Ah! comes Opportunity, knocking! A delicate inference, but we

fancy the ideas are somewhat connected. Good advice! Healthy work! What? The satisfying swish of the number 45 shovel through the air! The contented plop as the muck splashes in the empty mine car! The well-earned rest after the day of toil! The humble but happy home! Too bad that more of us are not willing to avail ourselves of these little happinesses.

But the writer is not so wrong at that. The only trouble is that he does not specify, does not mention when we should take up this new or related work. It may be inferred from the two articles that when the pick-and-shovel man goes to college he comes out a white-collar graduate, forever divorced from the pick and shovel until press of numbers and low salary drive him back into this or other "new or related work." In other words, he gets his pick and shovel at the end of his career instead of at the beginning, which is the great pity in the life of many an engineer. This is not because there are too many with an engineer's college training, which is good training, but because so few companies or individuals who employ the young graduate have an adequate system for eliminating *at the start* youngsters who are found weak in fundamental ability for the work they are beginning.

The greatest gift that any one of us can make a young man is to shift him, and shift him at once, into a line in which his inherent ability will enable him to make good. Too often a man will be retained in a line for which he is not fitted often because of engaging personal qualities, until his length of service really gives him a claim on his employer and he will go blundering on in work for which he is not suited for the rest of his days, or eventually get the figurative pick and shovel. No one can ever estimate what he has cost his employer, because no one can ever know what another man might have accomplished in the same position. It is unfortunate that some of the larger organizations, with their necessity for large numbers of technical men, do not develop a more rigorous training for youngsters, and endeavor to make promotions from among them only when they have battled their way up and shown they are superior to their companions. The result would be more respect and perhaps more pay for the engineering profession and a goodly number of men happier in some other kind of work for which they were better suited.

But "Ashes to ashes and dust to dust" or perhaps dirt in the case of the engineer. Several years ago a prominent mining engineer, stalled with his Packard, during a rainstorm, near one of the now almost deserted Colorado mining camps. He had to get out and get under, ruining his clothes in the process. When he reached the camp he was forced to get a new suit. It happened that this engineer had received his early education via the muck-stick route in the same camp and knew most of the inhabitants, but had not been there for many years. So he went directly to the shop of a little Irish tailor he remembered, still all covered with mud, and the following dialogue ensued:

"Hello, Jimmy! How are you?"

"Aha! Oho! So it's yersilf is it?"

"Jimmy, you have forgotten me; you don't know me from Adam. I am Tom Blank, and I used to work up on the Terrible about fifteen years ago."

"Oh, Mr. Blank, sure an I knowed ye the minit I laaid eyes on ye. And where have ye been?"

"Oh pretty near everywhere, Jimmy, since I left here, all over the world."

"Sure an I know me bye—jhust thrampin around—and now ye've come back home—(brightening). But sure it's a grand wilcome they'll give ye; they're nadin muckers very bad on the hill!"

Appearances are often misleading. The situation for engineers may become better. We hope the editor in this magazine may help make it so. At no time has the world ever needed engineers more. If they can bring into it a little more of the old-fashioned honesty, simplicity, and clear thinking, that as a class they are supposed to and should possess, they will probably be compensated justly.

Many business organizations now are headed by engineers. If they can keep the skirts of their own organization clean from bunk, unnecessary complexity, and the resulting politics, they have accomplished a great deal. Most of us have met somewhere along the path an employer the memory of whose clear head, honesty, and sympathy is sacred. Perhaps he did not pay us so much, perhaps he came down on us like a ton of bricks at times for some merited reason (and how we could grin at it when it was all over as we thought of the exact justice meted out), but how we looked up to him, for we had what was part of an engineer's pay —a square deal.

JAMES J. BOYD.

Aire Libre, Mexico.

An Articulate Traveler

THE EDITOR:

Sir—On reading your editorial (June 9) "As Others See Us," I was reminded of J. H. Curle's remarks in "The Shadow Show," in which he points out the vague ideas prevalent in England regarding the status of the mining engineer—especially among women.

In your editorial (May 19) on "The Inarticulate Traveler" you mention that the profession "lacks non-technical mouthpieces" and make a shrewd guess that the reason is that writing for publication does not pay. However, some of our brothers in the petroleum profession are not so dumb, judging from some amusing articles I have recently read giving a vivid insight into life in Mexico, Venezuela, and other countries. Curle is one of the articulate travelers and has written two books of personal experiences and opinions, "The Shadow Show" and "This World of Ours."

Los Angeles, Calif. WILLIAM MOTHERWELL.

Why the Dues Are High

THE EDITOR:

Sir—In line with the policy of every president of the A.I.M.E. of recent years, Mr. Mathewson is asking for recruits to the present large membership. For some reason, not quite apparent, the larger our membership the greater the costs per member, until it is now 60 per cent above normal, with probably four times the membership.

Such results are not in line with first-class engineering and do not speak well for those whom we have selected to take care of the affairs of the Institute, although accredited with being the best in the profession when called upon to administer the affairs of large mining or smelting companies.

I attribute the higher costs per member in part to the fact that many members take advantage of the life membership fee of $100, which based upon present annual dues, should be $320 at 5 per cent. I have been impressed with this fact by seeing many other dues

doubled because of many members taking advantage of the $100 life membership dues.

The A.I.M.E. should be of great assistance to the professional engineer, but in attempting to cover so many different lines of engineering it appears to be top-heavy and of late years to be falling away from those great principles to which its founders intended it to hold.

After forty years' association with the Institute I can faithfully say that it has been of great service to me as well as to many engineers with whom I am acquainted. The executives have been selected from the most efficient, but the general policy of uniting so many lines of engineering appears to have been a mistake which should be remedied even at this late date.

Kingman, Ariz. W. W. WISHON.

A Rich Country

THE EDITOR:

Sir—I submit an analogous case as further evidence to support the article appearing in the editorial columns on p. 963 of the *Journal-Press* of June 2 on arsenic production. Some time in December, 1902, I was detailed to survey a road in a very rugged section of the Cascade Mountains, and a late afternoon, about dusk, found me in a mountain meadow following a rather dim trail which was to bring me, according to information secured in the valley, to the place that was to be my headquarters while making the survey. Circumstances had compelled me to carry the entire equipment, such as a heavy transit, rod, range pole and other necessary things, and after climbing 1,600 ft. over a trail remarkable for its bold profile, I found myself among the scattering, gnarled old fir trees in a none too good humor, and even the frequent showers of the afternoon had failed to keep down my temperature. Taking a rest on a basalt boulder, getting some solace from smoking a "heel" in my pipe, I noticed a man crossing the meadow at about right angles to the course I had taken. I called to him and he informed me that I was going right and that another mile and a half would bring me to the point of my destination. We exchanged news briefly and before starting I asked what in the world brought him into such a blooming country. With a wide, sweeping gesture that embraced the many basalt boulders dotting the immediate landscape he rather impressively said: "Do you see these rocks? Aside from the gold and silver they carry, they assay 150 per cent in copper!" Reflecting a moment I concluded that I had better be going while the going was yet fairly good. To the credit of my informant it is but just to state that his information concerning trail and distance assayed 100 per cent. H. BUECHE.

Washougal, Wash.

"What Is Ore?"

THE EDITOR:

Sir—At various times the query "What is ore?" has been propounded in the *Journal-Press*, as well as in various other publications. During the last year I talked with an engineer who had just returned from a trip in Central America, where he had done some work on a deposit, carrying gold, that had been examined and reported on by engineers from another country. He said that the deposit was an oxidized formation about two hundred feet wide and quite a few hundreds of feet long, and that it had been sampled by the original prospectors by means of a series of trenches averaging 4 ft. in depth and extending across the width of the formation. The results of the sampling, as given by the original prospectors, had shown a value of several dollars in gold per ton of rock. The engineer said that he drove one or more tunnels to crosscut the deposit in depth, and found that the values did not extend much below the surface. Therefore he said "There was nothing there."

According to his statement, the deposit is a couple of hundred feet wide, several hundreds of feet long, and about 4 ft. deep. If one considers the deposit as a vein laying flat, its footwall the country rock, the hanging wall removed by erosion, the cubic contents would amount to a respectable volume, and if the sampling was trustworthy, it should contain quite a few ounces of gold. And yet, "There is nothing there." I am wondering "what is ore"? PROSPECTOR.

Chichagof, Alaska.

Backwoods Taxation Bandits

THE EDITOR:

Sir—There are certain points in your interesting editorial "The Backwoods Taxation Bandits" which are open to criticism. In a broad aspect, it seems to me that you are unconsciously trying to settle the question of "Paternalism vs. Individualism in Government." This is disturbing the souls of white, yellow, black and brown men of all classes everywhere. It is certainly a question that cannot be expected to be settled until we reach a static condition and then only by a recognition of all the changes in manners, customs, and other standards due to the progress of science and machine manufacture. These changes are so kaleidoscopic that no one can appraise them now. We can only wait. Not that I am a socialist—on the contrary I prefer Spencer's individualism, if we had emerged enough from our semi-simian nature to make it workable. To return to the point which I raised about your editorial, it seems that you are confusing in your thought and language.

Hartford, Conn. WOOLSEY MCA. JOHNSON.

The Twelve-hour Day

THE EDITOR:

Sir—The editorial in the *Journal-Press* of June 30 on the twelve-hour day in my estimation neglects a most important point. The only hard jobs in the steel plant are the roll feeders and the furnace repairs on open hearths. Mechanical appliances have been so greatly introduced that manual work is reduced to a small proportion of what it once was. As far as labor is concerned, the twelve-hour day is not a troublesome factor, but as far as the international economic position of the United States steel industry is concerned, it is a vital factor. The introduction of a third shift means about 25 per cent increase in cost of steel production. This would greatly interfere with our competitive position relative to other nations. Already other nations can market steel products on the Pacific Coast in competition with eastern manufacturers. The eight-hour day very likely carries with it the important resultant that domestic steel producers will be relegated to domestic markets. Judge Gary has undoubtedly in mind the maintenance of a sufficient margin on his production costs to enable him to exploit the foreign market when it becomes necessary. G. J. R.

San Francisco, Calif.

The Trail Smelter

Extensive Use of Electrolytic Methods Due to Liberal Research Policy and Available Water Power—Co-ordination of Hydrometallurgical and Smelting Operations Vital Factor in Handling Between Products—Pioneer Work in Electrolytic Zinc Deposition

By George J. Young
Western Editor

In 1911, I visited the Consolidated Mining & Smelting Co.'s smelter at Tadanac, British Columbia. Tadanac is the smelter station. A short distance below the river terrace upon which the smelter is situated and close to the Columbia River is the town of Trail. At the time the principal work was the smelting of lead and copper ores. The lead, obtained by smelting in blast furnaces, was refined by the Betts electrolytic process and cast into merchant pigs. The gold and silver were reduced in a refinery. In addition, copper ores were smelted in blast furnaces, and the matte obtained was shipped to Tacoma. The metal production for 1910 was: gold, 138,901 oz.; silver, 2,017,007 oz.; lead, 33,871,837 lb.; and copper, 5,282,139 lb.; total value, $5,543,574. The plant was excellently managed and the equipment and methods were comparable with those in use elsewhere. In August, 1922, I visited the plant again. Needless to say, the present plant afforded a great contrast with that of 1911.

Initial construction of the Trail smelter began in October, 1895. The smelting company was called the British Columbia Smelting & Refining Co. and the works were described as being on Trail Creek. The first furnace was started in February, 1896, and before the end of the year the plant was in complete operation. The enterprise was established by F. Augustus Heinze. In addition he built a narrow-gage railroad from Trail to Rossland, as the ores from this district were the objective. Heinze also obtained a land grant from the Dominion government to build a railroad from Trail to Vancouver. The end of his Canadian venture came when the Canadian Pacific Railway bought out all of his interests in British Columbia, paying for them, it is stated, $1,200,000.

Equipment for Copper Ores Only, at Start

The equipment of the smelter consisted of a 150-ton sampling mill; a 9x90-ft., double hearth O'Hara roasting furnace; six Herreshoff calciners; four 16x22-ft. reverberatory smelting furnaces; a 40-in. circular water-jacketed blast furnace; and a 38x120-in. water-jacketed blast furnace with removable crucible and forehearth. By the middle of 1896 the plant was smelting from 140 to 160 tons of ore per day. The concentration ratio was 20 to 1. The copper matte was shipped to Butte for further treatment.

The plant was enlarged in 1898 and in 1899 began to treat lead ores in addition to the copper ores. It was enlarged further in 1906. Since then many additions have been made. The electrolytic zinc plant was erected in 1915 and the first zinc produced from it in February, 1916. A sulphuric acid plant was erected in 1916 and also a hydrofluoric acid plant in the same year. The Huntington-Heberlein pots were discarded and Dwight & Lloyd sintering machines put in their place. A copper wire-bar mill was erected in 1921. An addition to the lead electrolytic plant was completed in 1922.

The present plant is equipped to produce electrolytic copper and wire bars; electrolytic lead and hard, or antimonial lead; electrolytic zinc, and zinc dust; fine gold and silver; sulphuric and hydrofluoric acids and copper sulphate. It is one of the most complete metallurgical works in the Americas. At the time I visited the plant in 1922, it was producing merchant lead and zinc, gold and silver, copper sulphate, and sulphuric and hydrofluoric acids. The copper smelting furnaces, copper electrolytic refinery and the wire-bar mill were not in operation, owing to the prevailing copper prices. The metal production from 1907 to 1922, inclusive, is shown in Fig. 1.

Personnel of the Operating Division

Selwyn G. Blaylock is general manager of the company. His staff consists of the following: W. M. Archibald, manager of mines; R. W. Diamond, superintendent of concentration, assisted by W. H. Hannay and C. T. Oughtred; James Buchanan, superintendent of smelters, assisted by G. E. Murray and R. K. Blois; B. A. Stimmel, superintendent of the zinc plant, assisted by F. S. Willis, H. Woodburn and Graham Cruickshank; J. J. Fingland, superintendent of refineries, assisted by H. R. Motherwell; G. F. Chapman, chief engineer in charge of shops and construction, assisted by E. M. Stiles, W. B. Kinnear and M. O'Brien; F. E. Lee, A. L. McCallum, D. G. Bisset and S. Gray are the staff of the research laboratory and G. W. Cotton is chief chemist.

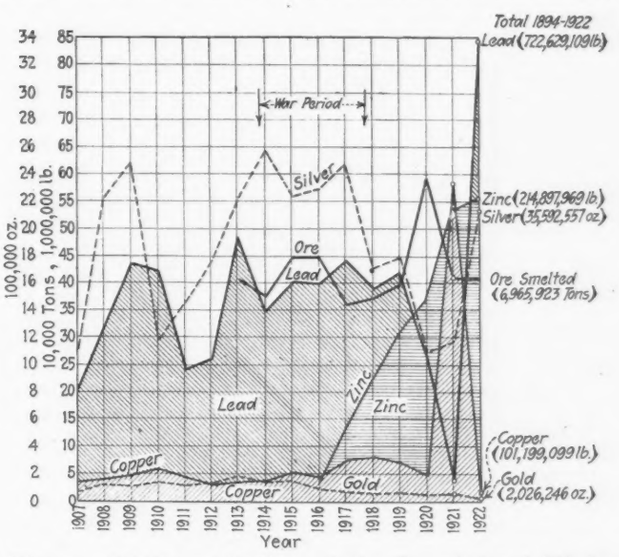


Fig. 1. Metal production of the Consolidated Mining & Smelting Co. of Canada

Practically all of the men upon the staff have been with the company a long time and as a consequence the staff functions excellently. Long experience with the problems of the situation and close association with one another, together with the liberal research policy of the company, has contributed to the development of an

exceedingly strong group of men who may be expected to continue their noteworthy work in non-ferrous metallurgy.

A modified Whitely system is being tried out for the handling of all questions relating to the workmen of the plant. A co-operative committee, formed by one man from each department and having a membership of twenty-four, meets directly with the general manager. The committee has initiative in everything pertaining to the labor side of work. It takes full charge of grievances and settles many such problems itself. The plan works excellently. Both the workmen and the management receive first-hand information of labor difficulties. A welfare and safety engineer is part of the organization. This co-operative move has improved the efficiency of the plant materially. A system of performance bonuses has been installed to get workmen to take more interest in their work. It recognizes efficiency in lowering costs and increasing recoveries. The bonuses are based on group costs and recoveries. The bonus is given to a group of men. Repair men are given a bonus which is an average of other bonuses.

Mines of the Consolidated

The Consolidated handled about 385,000 tons of ores from its own mines in 1922 and over 21,000 tons of ores purchased from independent mines. The value of the custom ore in 1922 was $1,194,389, or slightly over 10 per cent of the total production. Thus the Consolidated is in the substantial position of commanding sufficient ores from its own mines for over 80 per cent of its plant capacity. The bulk of the production is derived from the mines at Rossland and the Sullivan mine at Kimberley. The Sullivan mine is noteworthy in having reserves which insure steady production in the future for twenty years or more.

The company owns sixteen mines, of which eleven were operated to a greater or less extent in 1922, substantial production being made, however, from only three during that year. The Rossland group includes the Centre Star, Le Roi, War Eagle, and Iron Mask mines. The 1922 production was 18,566 tons. The Richmond-Eureka mine, at Sandon, made no production. The Sullivan mine, at Kimberley, produced 349,839 tons of zinc-lead ore, 8,926 tons of lead ore and 2,088 tons of pyrite. The Molly Gibson made a small production; Number One, six miles from Ainsworth, made a small production of silver-lead ore; the Highland, 1.5 miles from Ainsworth, also produced a small amount of lead-silver ore and lead concentrates; the Ottawa group in the Slocan City district shipped a small lot of concentrates; the St. Eugene, Lucky Thought, Silver King, Emma, Phœnix Amalgamated, Number Seven and San Poil made no production. The Rock Candy mine, at North Fork, near Granby Forks, produced 4,219 tons of fluorspar concentrates. A limestone quarry on the Kettle Valley railroad, fifty miles from Trail, supplied limestone flux during the year. Data on the mines are given in Table I.

Railroad Situation

Trail is connected with Vancouver by the Kettle Valley railroad, one of the scenic routes of British Columbia. This railroad crosses the Cascades and the Kootenays. Part of the construction is through an exceedingly complex topography. The Great Northern railroad connects Spokane, Rossland, and Nelson. Fernie, which supplies coke and coal, is connected by the Crow's Nest Pass branch of the Canadian Pacific railroad with Kootenay Lake. From Procter, on the lake, railroad connections with Trail are available. Kootenay and Arrow lakes connect with various branch railroads which afford combined water and rail transportation for a comparatively large area of mountainous country. The West Kootenay Power & Light Co., Ltd., a combination of various former power companies and now interrelated with the Consolidated as a subsidiary company, supplies hydro-electric power from its plant at Bonnington Falls. The present power load of the company is in excess of 27,000 hp. A power plant on Bull River supplies electric power to the Sullivan mine, at Kimberley. Increased hydro-electric power development is contemplated.

The situation possesses many advantages. Fundamentally there is a dependable ore supply. Coke and coal supplies are not far distant, although the freight cost is relatively high. Limestone and other necessary fluxes, including siliceous ores, are available. Cheap power, the development of which entailed about $200 per horsepower, is at hand. The country affords further opportunities of developing hydro-electric power. The markets are distant, being principally in eastern Canada and the Orient via Vancouver.

Table I—Development and Production of Mines Owned by the Consolidated

Mine	Total Development Footage, Feet	Total Ores from 1894 to End of 1922, Tons	Ores
Rossland mines	335,334	4,978,260	Gold-copper smelting and concentrating
White Bear	10,382	3,002	Gold-copper
Sullivan	48,699	1,691,587	Zinc-lead, lead, and pyrites
St. Eugene	106,321	1,926,587	Lead and zinc
Molly Gibson (*a*)	12,181	9,106	Silver-lead
Number One (*a*)	10,198	24,999	Silver
Highland (*a*)	19,278	10,234	Lead-silver and lead concentrate
Ottawa (*a*)	11,626	1,792	Silver ore and concentrates
Lucky Thought	3,490	1,816	Lead-silver and silver-zinc
Richmond Eureka	9,699	19,420	Lead-silver
Silver King (*a*)	20,462	17,238	Silver-copper
Emma	7,644	262,560	Copper
Phoenix Amalgamated	2,581	2,493	Copper
Number Seven	5,934	7,388	Siliceous gold
Rock Candy	1,884	20,040	Fluorspar and fluorspar concentrates
Coast Copper Co.	6,222	.....	.....
San Poil (*a*)	.....	18,470	Siliceous gold

(*a*) Production since company acquired mine; other productions include production under previous owners.

During 1922, the metal product from 407,200 tons of ore amounted to 70,600 tons, or a ratio of 5.76 tons of ore to one ton of metal. This is the outgoing freight which brings revenue to the railroads; ore, coal, coke and supplies constitute the incoming freight. Freight on the company's ores averaged slightly under $1.70 per ton during 1922. Costs at the reduction plant approximated $45.80 per ton of metal produced; sales approximated an average of $127.60 per ton of metal sold and the net annual profit was about $16.30 per ton of metal sold, or $17.40 per ton of metal produced. The foregoing figures are approximate estimates made from the costs and production statistics given in the annual report of the company for 1922.

General Features of the Plant at Tadanac

The smelting plant is upon a high river terrace overlooking the Columbia River. The site is comparatively level. Slag and waste products go over the bluff above the river. All parts of the plant are connected by standard-gage tracks and are served by narrow-gage tracks upon which trolley-type electric locomotives are operated. Water is pumped from the Columbia River and is also flumed from Trail Creek. The plant is divided into four parts: the lead and copper smelting unit, the refinery

unit, the zinc unit, and the concentrator. The shops, offices, and warehouses are in close proximity to the smelting and zinc units. Dwellings for some of the officials and accommodations for assistants are provided on the plant site. Most of the workmen live in Trail, which is below the plant on the bank of the river. Like many other smelting plants which have attained a ripe age and which have grown rapidly, the older buildings and parts of the plant contrast with the more recent construction. However, the plant as a whole is convenient and well arranged.

Smelting Unit

The raw-ore supply comes principally from the Sullivan mine and consists of finely divided lead concentrates. This constitutes 90 per cent of the lead ore. A varying amount of lump ore is shipped from the Slocan. The Ainsworth mining division supplies sulphide ores. Copper ores come principally from Rossland in the form of a gold-copper ore; eventually this ore will be concentrated and the copper concentrates will be smelted instead of lump ore. Copper Mountain of the Canada Copper will ship its copper concentrates to Trail when its property is in operation. This property has a modern flotation mill and will ship from 100 to 150 tons of 20 per cent copper concentrates when in operation. The Coast Copper Co., Ltd., at Elk Mountain, Vancouver Island, and the Sunloch Mines, Ltd., at Sooke, B. C., both controlled by the Consolidated, will also supply copper ores.

Lead smelting follows established practice: sintering of the fine ores and smelting of the sinter in blast furnaces. Fig. 2 shows the flow sheet. The Dwight & Lloyd sintering plant consists of six sintering machines; an additional machine was in course of construction at the time of my visit. The raw ore is sent over the first three machines and the resulting sinter is crushed and resintered with the addition of 13 per cent of granulated slag, the lead blast furnace slag being used for the purpose. Wedge roasting furnaces are available for preroasting.

All lead concentrates over 0.25 in. in size are crushed and sampled by Vezin samplers. The limit size for sintering is 0.25 in. Fine concentrates and flotation concentrates are sampled by means of a pipe sampler, or a split shovel, and are placed in the Dwight & Lloyd bins or bedded in separate bins. The limestone used in the sintering mixture is crushed to 0.25 in. size. Lump limestone is added to the blast-furnace charge as required. The first charge sent to the Dwight & Lloyd machines contains 14 per cent sulphur and is discharged at 9 per cent sulphur. The second roast produces a sinter containing under 2 per cent sulphur, usually 1.5 per cent. Due to the double treatment, the sulphur content is often under 1 per cent.

Four lead blast furnaces, 45x180 in., are available. Two were in operation at the time of my visit in 1922. The average tonnage of each is 230 tons per day. The charging is by means of side-dumping cars, which receive the ore from overhead pans into which the charge is weighed from the bins and dumped into the charging cars, which are handled by electric locomotives. The blast-furnace slag is discharged into a forehearth and then to a launder. A siphon tap is used and the usual lead-well arrangement. No matte is made in the lead blast furnaces. The slag is granulated and laundered to waste. Part of the granulated slag is recovered by a centrifugal pump and pumped into a bin to be used in the preparation of the sintering charges. The lead is recovered as blast-furnace bullion and is wheeled in small pots to the 50-ton drossing kettles, where the lead is drossed, the dross going back to the blast furnaces and the lead being cast by a casting machine into anodes, which are transported on special cars to the lead refinery. Cottrell treaters are connected with the Dwight & Lloyd sintering plant and also with the flue system of the blast furnaces. The gases from the lead blast furnaces first pass through a humidifying flue and then to the treater. All of the Cottrell flue dust is reclaimed and forms a part of the charge sent to the Dwight & Lloyd sintering machines.

The lead blast furnace is run on a high-zinc charge. No special trouble is experienced except with accretions in the upper part of the furnace shaft. Bombs are used

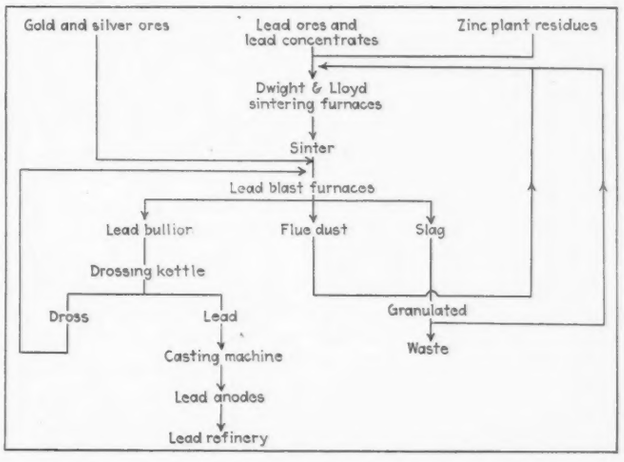


Fig. 2. Flow sheet of the lead-smelting unit

in the lead wells when they show signs of trouble. Once every shift the furnace man introduces into the lead well a half-inch pipe attached to a compressed-air hose carrying air at 60 to 80 lb. pressure. This "air gun" is also used as a bar through the tap hole to stir "things" up. There is usually little trouble at the tuyère line. The blast pressure is 36 oz. Root blowers, direct-driven through flexible couplings and motor, are used. Some of the blowers are driven by belts. Silent chains were tried between motors and blowers, but were discarded.

The type slag used in the lead blast furnaces contains 18 per cent silica, 18 per cent zinc, 31 per cent iron, 9 per cent lime and 1.7 per cent lead. The percentage lead loss is greater with low-lead charges. The tendency is to use high-lead charges which may reach 39 per cent of lead. The ore column is carried from 15 to 19 ft. high. With the high-lead charge, the silver in the slag is about 0.2 oz. per ton; lead 1.7 per cent, sulphur 1.5 per cent, alumina 3 per cent, lime 7.5 per cent, zinc oxide 17.8 per cent, silica 18.6 per cent, and iron 33.5 per cent.

Copper Smelting

Copper ores are first crushed to 4-in. size, sampled in the sampling mill by a Vezin sampler and then trammed to the storage beds. They are recovered from the beds by an underground tunnel. The copper blast furnaces are three in number, 42x420 in. arranged parallel to each other. A forehearth, 9 ft. in diameter, is on the side at the middle of each furnace. The daily charge is 600 tons to each furnace. Only one furnace is operated at a time. The matte is tapped and averages 18 per cent

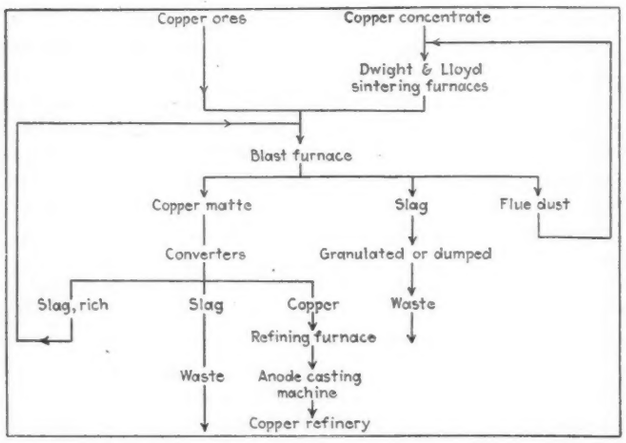


Fig. 3. Flow sheet of the copper-smelting unit

copper. The two converters are close to the furnaces and are served by a traveling crane. They are of the Great Falls type and are equipped with automatic tilting devices and lined with magnesite brick. Siliceous ores and cleanings as well as converter flue dust are smelted with the matte. The matte is blown to blister copper and poured into an anode refining furnace and then cast into anodes by a circular casting machine. The anodes are transported to the near-by refinery. The converter slag is returned to the blast furnaces for cleaning. A Cottrell treater is installed in the flue system of the converters, but no treater is used for the gases from the blast furnace flues, which are equipped with the ordinary facilities for retrieving a portion of the flue dust.

The blast pressure is 36 oz. The slag approximates the following composition: silica 42.2 per cent, iron 17.6 per cent, alumina 10.4 per cent, lime 15.9 per cent, and magnesia 3 per cent. Dwight & Lloyd sintering machines are used for desulphurizing copper concentrates when roasting is necessary. The furnaces are charged by running the charge cars into the furnace from the end. Each charge car is provided with wheels on the upper edges, which engage with a track within the furnace running parallel with the length. The charge cars are gable-end and side-dumping, the side doors being tipped from openings alongside of the furnace. The flow-sheet of the copper-smelting unit is shown in Fig. 3.

The Zinc Plant

The zinc plant has an output of 85 tons per day under the usual operating conditions, but this can be brought up to 100 tons per day. The improvements made in selective flotation at the concentrator, resulting in the production of a high-grade zinc concentrate, are of great importance, as there is less iron to be sent to the roasters. Consequently the iron is easier to oxidize thoroughly and there is less iron to be precipitated from the solution.

The calcine is produced by thirteen standard seven-hearth Wedge roasters arranged in two buildings separated by a brick flue. Two additional Wedge roasters were added recently to take care of custom zinc ores. A drying and ball-mill unit is provided for concentrates which require preliminary grinding. The sulphur content of the calcine is kept within a maximum limit of 0.75 per cent. The first hearth of each furnace is used as a drier; the fifth hearth is maintained at a temperature of 1,200 deg. F. by pyrometric control; the sixth hearth is maintained at 1,350 deg. F. A variation of 100 deg. up or down produces a noticeable difference in the composition of the calcine and requires immediate correction. The roasters are coal fired on both the fifth and sixth hearths by combustion chambers placed on opposite sides of the roaster. The capacity of each roaster is 40 or more tons per day. The calcine is delivered by worm conveyors to a bucket elevator and received in steel hoppers.

The object of the solution treatment of the calcine is to dissolve the zinc and to produce as pure an electrolyte as possible, free from metals electro-negative to zinc. Arsenic, cadmium, copper, and antimony must therefore be removed from the solution. The iron in the calcine must be present as ferric oxide so far as possible.

The calcine is fed into a series of four 10x30-ft. Pachuca agitators (primary agitation; acid neutralization), together with the solution resulting from the acid treatment and about 10 per cent of the spent acid electrolyte, or tailing solution from the electrolytic cells. The pulp is passed successively through the Pachucas, the final pulp flow going to two Dorr classifiers in series, the sand from the first classifier being re-treated in the second; the overflow is received in a 40-ft. Dorr thickener; the final sand is pumped by centrifugals to four 10x30-ft. Pachuca agitators (*A* in Fig. 4), where it is treated with the remaining 90 per cent of the spent acid electrolyte. The Dorr thickener is used as a surge tank to feed four 40-ft. and three 32-ft. thickeners, the underflow of which is sent to the secondary Pachucas (*A*), and the overflow to the third group of Pachucas,

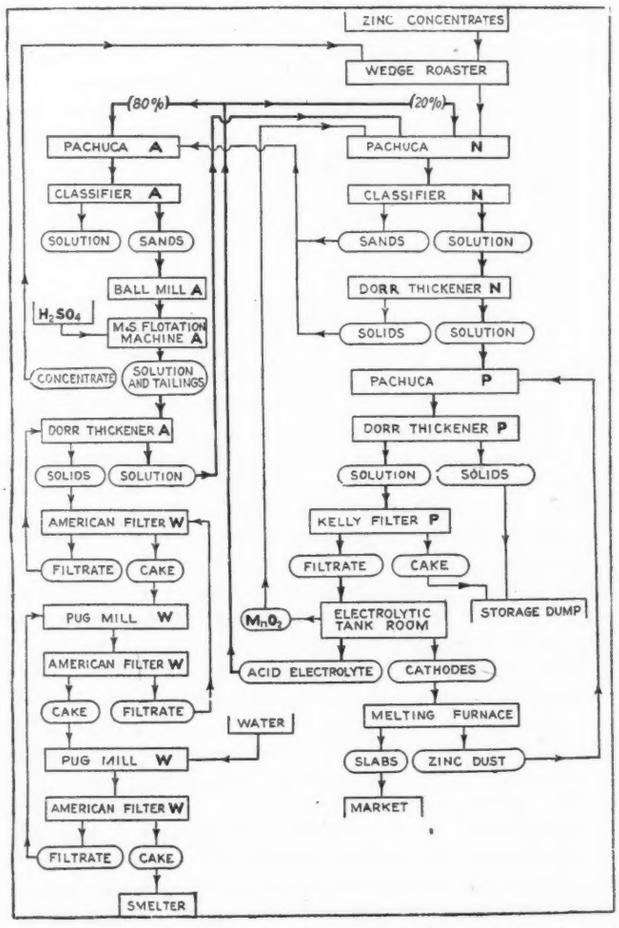


Fig. 4. Flow sheet of the zinc calcine solution treatment. A, acid solutions; N, neutral solutions; P, purification of neutral zinc sulphate solution; W, water.

three 8x20 ft. (*P*). The zinc solution at this stage is neutral. Zinc dust, sufficient to precipitate the copper, cadmium, and the remaining traces of arsenic and antimony, is added to the first Pachuca in the series. The final flow is received by a 23-ft. thickener; the underflow is delivered to the storage dump; the overflow is filtered by seven Kelly filters and the filtrate is pumped to the electrolyte storage tanks which supply the electrolytic cells. The cake from the filters is delivered to the storage dump. The electrolyte contains 60 gm. of zinc, 0.02 gm. of iron and 0.005 gm. of copper per liter.

The treatment in the secondary Pachucas (*A*) is as follows: The flow from the last Pachuca in the series, after acid treatment, is divided between two Dorr classifiers in series, the sand from the first being re-treated in the second; the sand is fed to a 6x6-ft. ball mill, the discharge of which and the classifier overflow being separately fed to 8-cell M. S. flotation machines which recover any zinc sulphide remaining. About 35 tons of zinc concentrate, containing about 41 per cent zinc, is obtained after thickening and filtration on a 12x12-ft. Oliver filter. The concentrate is returned to one of the 25-ft. Wedge roasters. The tailings from the flotation machines and the Oliver filtrate are distributed in parallel to seven 40-ft. thickeners; the acid overflow is returned to the primary Pachucas as acid solution; the underflow, containing soluble zinc, is washed by three American filters and two pug mills in series; the first filtrate is returned to the feed launder of the thickeners; the filtrate from the third filter is used in the first pug mill; the filtrate from the second filter is added to the feed of the first; water is used in the second pug mill. The cake from the third filter is dried and sent to the smelter for the recovery of the lead and silver. The flow sheet given by L. W. Chapman is shown in Fig. 4.

The electrolytic cells are grouped in two tank houses, each with its generator room. No. 1 tank house contains 448 cells arranged in fourteen sections of thirty-two tanks each. No. 2 tank room contains 384 tanks arranged in parallel rows of eight double tanks to the row. Each cell contains seventeen anodes and sixteen cathodes. The anodes are cast electrolytic lead, 22x33x 0.25 in.; the cathodes are rolled aluminum sheet 24x36x 0.1 in. L. W. Chapman describes the zinc-room practice and gives details in *Chemical and Metallurgical Engineering*, Vol. 23, p. 227. The only essential detail necessary to add is that the electrolytic cells are now being lined by a mixture of sulphur and sand cast on the sides and bottom of the tank.

The zinc stripped from the cathodes is melted in coal-fired reverberatories and cast into slabs. It is about three nines in purity, 99.999 per cent. No byproducts are made, as the copper and cadmium are small in amount. Sufficient zinc dust to supply the requirements of the zinc-solution plant is made in the zinc-melting room. The dross obtained in melting is treated in a dross drum to remove all of the metal possible and the remainder is placed in a tank and dissolved by spent electrolyte, the resulting solution being treated in the cells. The power consumption required in zinc deposition is 1.45 kw.-hr. per pound of zinc.

Refinery Operations

Both the base bullion and the copper anodes are electrolytically refined. The lead and copper electrolytic refineries are housed in separate buildings. The lead refinery (Betts process) has a capacity of 150 tons of lead, a new addition to the plant having been completed in 1922. The tanks, of which there are 492, are arranged in groups (seven tanks in a row), the electrolyte cascading through the tanks in a given row; the electrolyte enters at the surface and escapes by a bottom overflow. Individual feeds, 1.5-in. hard rubber pipes, are provided for each cascade. Beneath the tank floor is a launder system for handling slime and electrolyte. The problem is to secure a leak-proof tank, as the electrolyte is expensive. The tanks are made of reinforced concrete, the reinforcement being chiefly at the corners. The bottom and sides are 4-in. thick. They are lined with a mixture of oil-asphalt and 20 per cent of sulphur. In the old plant, the tanks are 7.33 ft. long, 2.5 ft. wide, and 3.58 ft. deep (inside dimensions); the new tanks are 8.5x2.5x3.58 ft. The space between tanks in cascade is 5 in. and the drop between cascades is 3 in. The old tanks hold twenty anodes and twenty-one cathodes; the new tanks twenty-four anodes and twenty-five cathodes; the spacing between anodes is 4.125 in. The cathode sheets, 31.5x27 in., are hand-cast on a sloping iron plate and the end rolled on 0.5x1-in. copper bar. The anodes are 29.5x26x1.125 in.; weight is 320 lb. and each anode is in the tank eight days. The anode scrap amounts to 20 per cent. Two crops of cathodes, four days each, are taken. The average current density is 14.5 amperes per sq.ft.; the voltage drop is 0.3 to 0.55, according to the age of anodes and the thickness of adhering slime. The electrolyte contains 10 per cent hydrofluosilicic acid and from 6 to 7 per cent lead, and is used at a temperature not exceeding 37 deg. C. The slime adheres to the anode throughout electrolysis; the neutral salt, lead fluosilicate, concentrates in the electrolyte. The electrolyte does not require purification. It contains small amounts of tin, nickel and bismuth.

The slime is removed from the anode by hand scrubbing and washing with electrolyte; it is then transferred by gravity to stationary vacuum filters and washed, first with dilute hydrofluosilicic acid and then with water until it is free from lead fluosilicate; the washings of working strength are returned to the tanks as electrolyte; weak wash is re-used until it reaches the proper strength. The new equipment in the slime recovery includes filter presses for quick washing in conjunction with the vacuum filters.

The electrolyte is handled in hard-rubber pipes; the valves are of hard rubber; copper pumps and plungers are used for elevating the electrolyte. "P. & B." roofing paint and asphalt is used for lining all of the launders and protecting the tanks from leakage. The flow sheet of the refinery is given in Fig. 5.

The cathodes after washing are melted in 60-ton kettles; the melting period is eight hours; this is followed by heating up gradually for an eight-hour period and

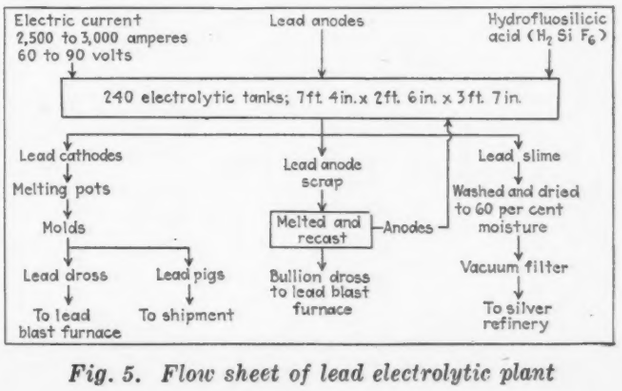


Fig. 5. Flow sheet of lead electrolytic plant

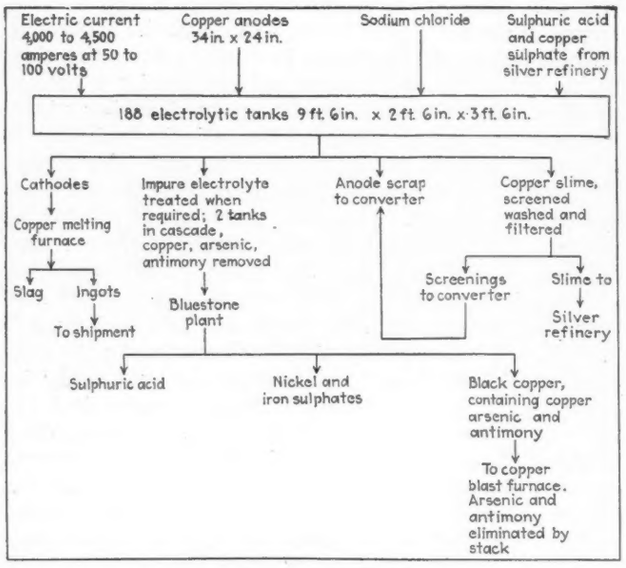

Electric current 4,000 to 4,500 amperes at 50 to 100 volts
Copper anodes 34 in. x 24 in.
Sodium chloride
Sulphuric acid and copper sulphate from silver refinery
188 electrolytic tanks 9 ft. 6 in. x 2 ft. 6 in. x 3 ft. 6 in.
Cathodes
Copper melting furnace
Slag
Ingots
To shipment
Impure electrolyte treated when required; 2 tanks in cascade, copper, arsenic, antimony removed
Bluestone plant
Anode scrap to converter
Copper slime, screened washed and filtered
Screenings to converter
Slime to
Silver refinery
Sulphuric acid
Nickel and iron sulphates
Black copper, containing copper arsenic and antimony
To copper blast furnace. Arsenic and antimony eliminated by stack

Fig. 6. Flow sheet of copper electrolytic plant

then the molten lead is air-poled fifteen to twenty-five minutes to remove the small amount of antimony; in the third eight-hour period the lead is cast in stationary molds placed in a ring around the kettle. No. 3 Rumsey pumps are used to pump the lead into the central cup which feeds the lead launder. The pigs are skimmed free from dross and loaded upon trucks, thirty-two pigs to the truck, and transferred to cars for shipment.

The copper refinery is in a steel concrete building and the equipment and practice are similar to that of most copper refinery plants. The flow sheet is given in Fig. 6.

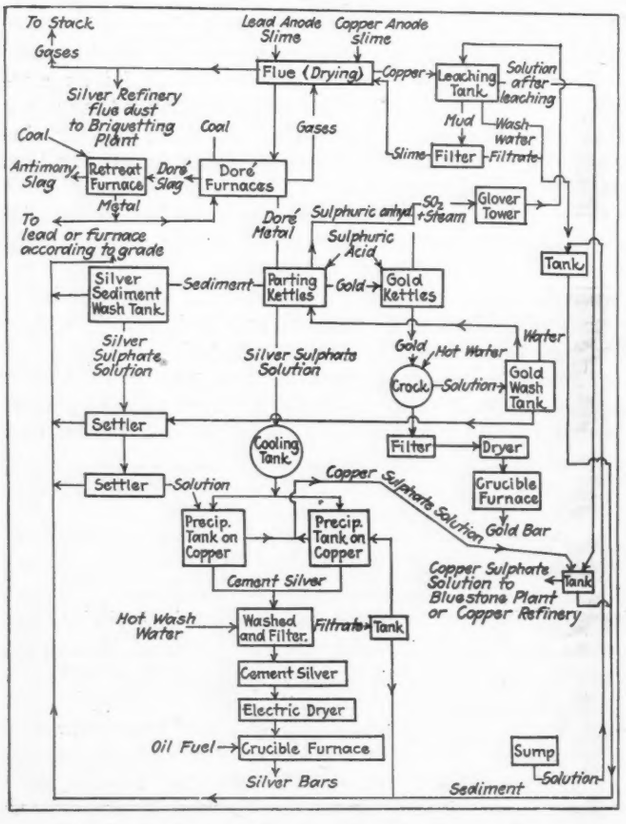


Fig. 7. Flow sheet of gold and silver refinery

The gold and silver refinery is in a separate building close to the electrolytic copper and lead buildings. The anode slimes from both plants are received separately and are dried in a special chamber which is a part of the flue system of the reverberatory smelting furnaces. The copper anode slime is leached, after partial roasting in the flue, to remove as much copper as possible. Both lead and copper slimes are smelted to doré metal in small reverberatory furnaces lined with magnesite brick. The slag is re-treated in a second furnace; the antimony is recovered in a lead slag which is reduced and the lead and antimony recovered. The procedure from this point on is typical of most gold and silver refineries. The details of treatment of the doré metal are given in Fig. 7.

Copper sulphate is recovered from the solutions obtained from the silver precipitation and the treatment

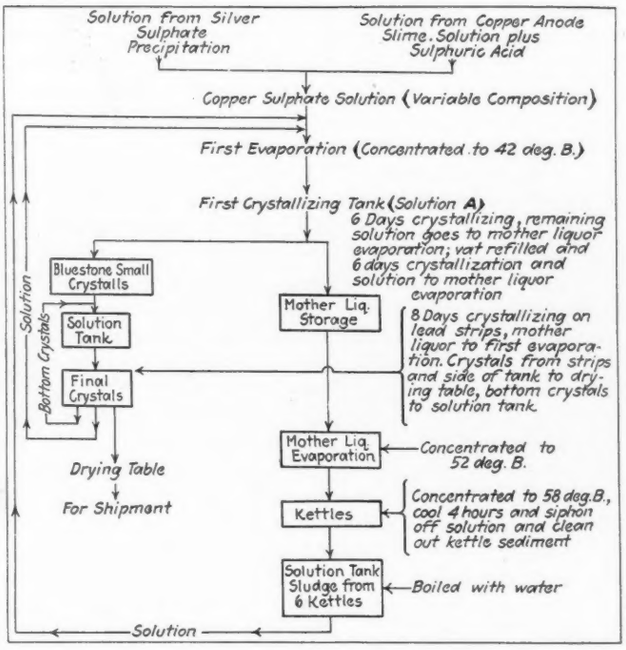
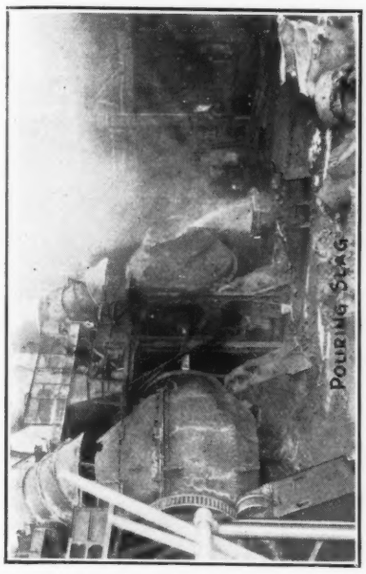

Solution from Silver Sulphate Precipitation
Solution from Copper Anode Slime. Solution plus Sulphuric Acid
Copper Sulphate Solution (Variable Composition)
First Evaporation (Concentrated to 42 deg. B.)
First Crystallizing Tank (Solution A)
6 Days crystallizing, remaining solution goes to mother liquor evaporation; vat refilled and 6 days crystallization and solution to mother liquor evaporation
Bluestone Small Crystals
Solution
Bottom Crystals
Solution Tank
Final Crystals
Mother Liq. Storage
8 Days crystallizing on lead strips, mother liquor to first evaporation. Crystals from strips and side of tank to drying table, bottom crystals to solution tank.
Mother Liq. Evaporation
Concentrated to 52 deg. B.
Drying Table
For Shipment
Kettles
Concentrated to 58 deg. B., cool 4 hours and siphon off solution and clean out kettle sediment
Solution Tank Sludge from 6 Kettles
Boiled with water
Solution

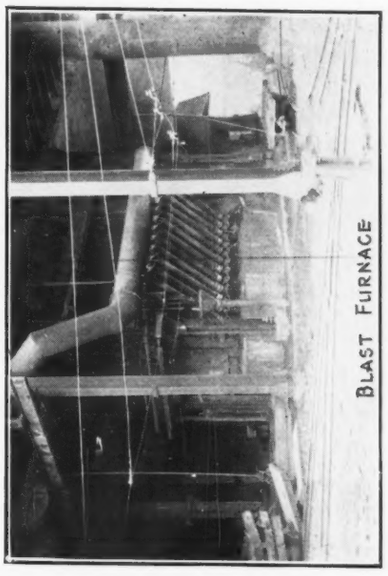
Fig. 8. Flow sheet of bluestone plant

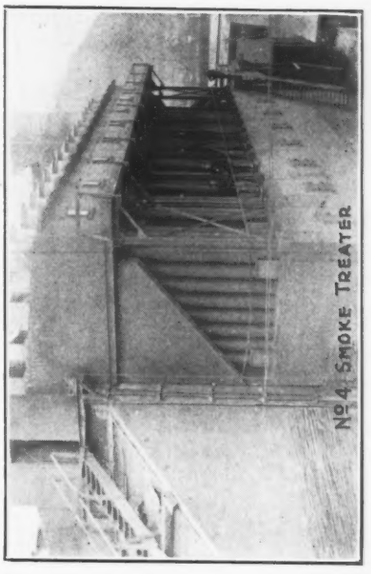
of the copper anode mud. This is done in a separate building not far distant from the gold and silver refinery. The details are given in Fig. 8. Two acid plants are in operation. Six generators are in use in the hydrofluoric acid plant. Each holds a charge of 1,500 lb. of finely ground fluorspar. The generators are horizontal retorts which are charged at the top by means of movable hoppers. The ends of the retort are removed when the spent charge is discharged. This is done by hoeing out the residue, which is in the form of a moderately plastic mass. It is received into cars and hauled to the dump. The acid is absorbed in towers.

The sulphuric acid plant consists of a battery of lump burners which receive pyrite in egg-size pieces. The sulphur dioxide gas is passed over nitrating pots and thence to the lead chambers. The acid plant is relatively small but produces sufficient acid for the hydrofluoric acid plant, the copper electrolytic refinery, the gold and silver refinery and wherever acid is required in the plant.

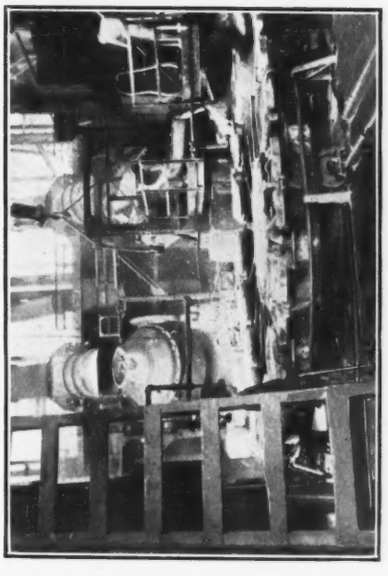
The various smelting, refinery and zinc electrolytic deposition plants form a closed circuit in which the

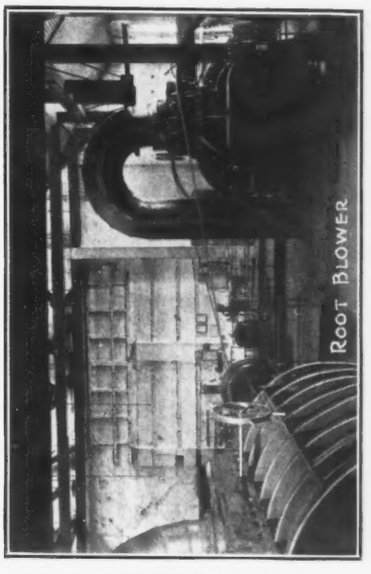

POURING SLAG


BLAST FURNACE


No. 4 SMOKE TREATER

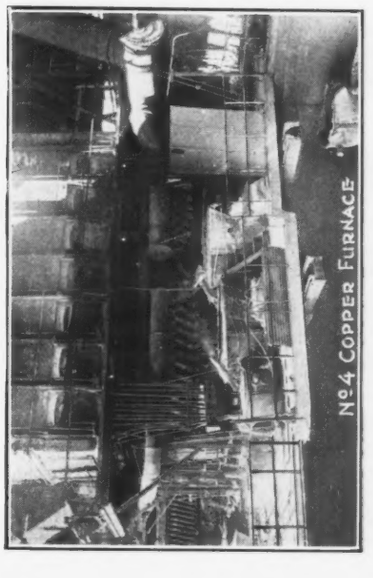
CHARGING CONVERTER

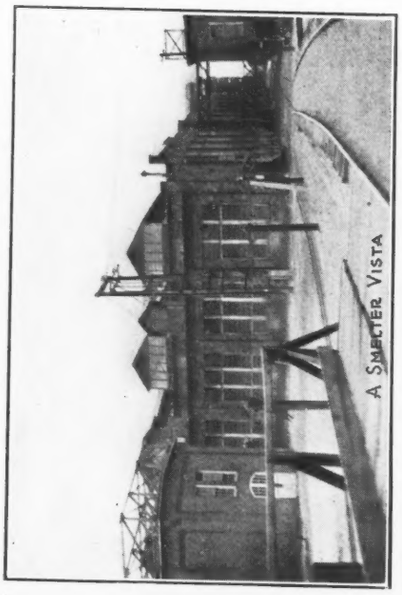


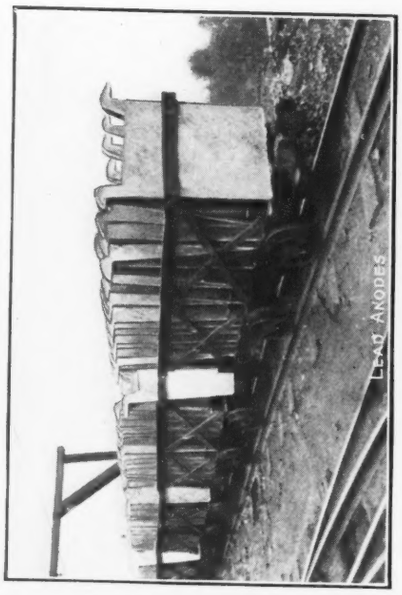

ROOT BLOWER

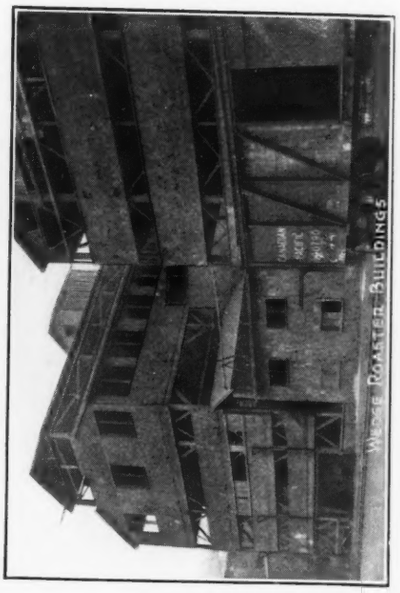
TRAIL SMELTER

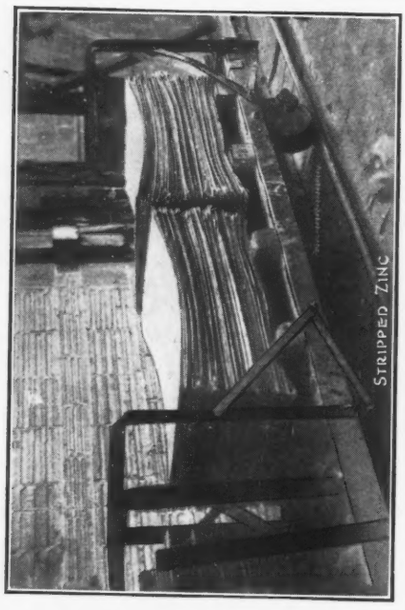
TAPPING MATTE

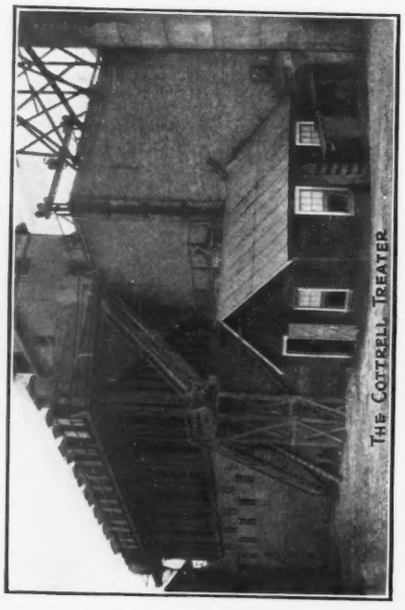

No. 4 COPPER FURNACE


A Smelter Vista


Lead Anodes

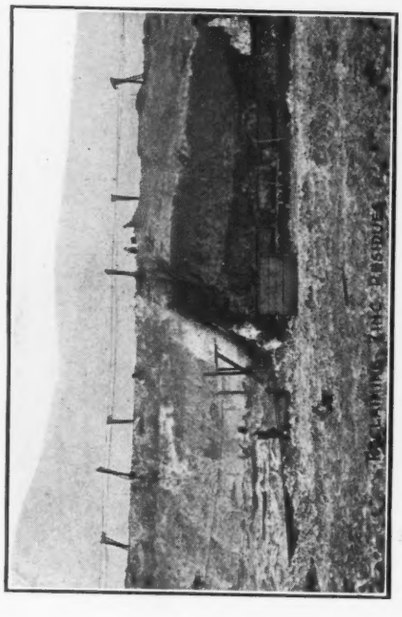

Wedge Roaster Buildings


Stripped Zinc

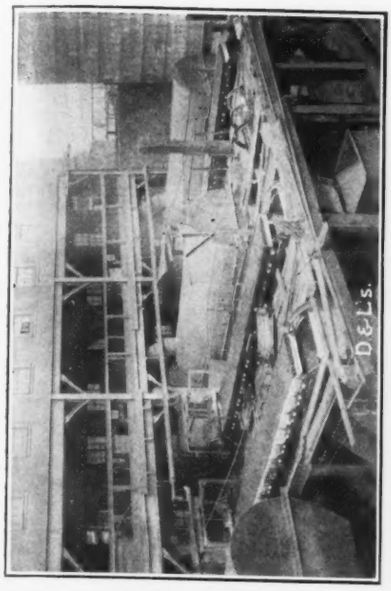

The Cottrell Treater

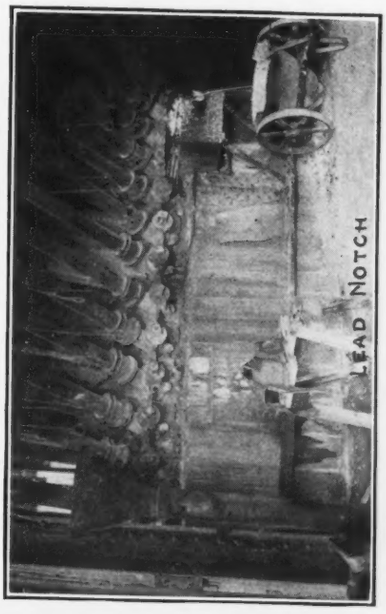
Copper and Lead Slag Piles

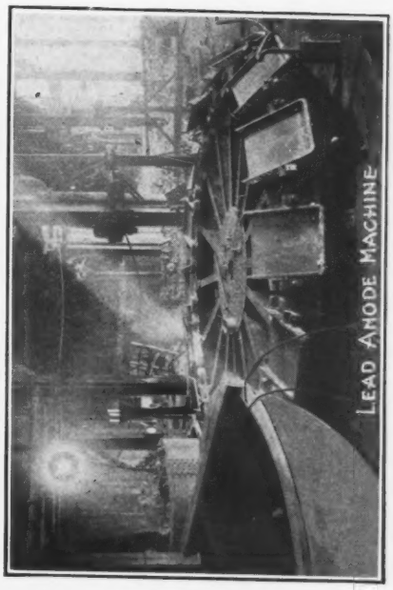
D. & L. Furnaces

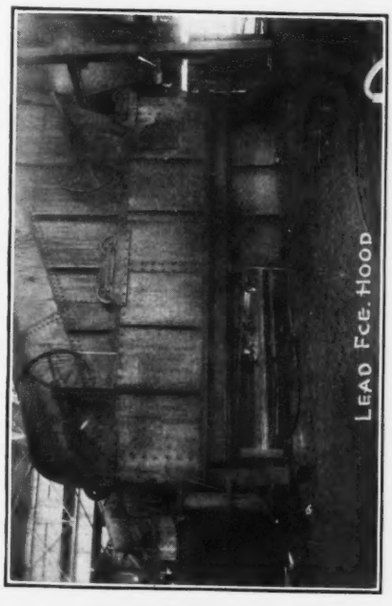

Pulling Zinc Residue

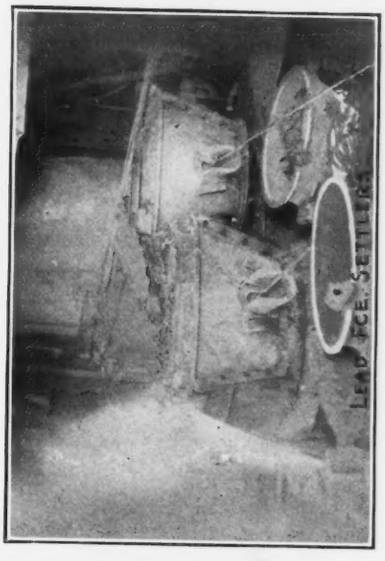
Pulling Spent Charge from Hydrofluoric Acid Retorts


D.E.L.s.

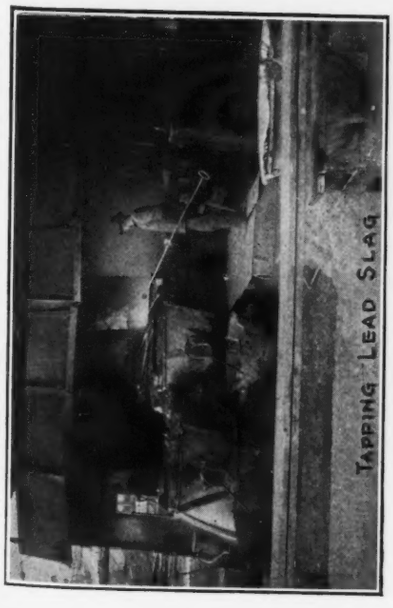

LEAD NOTCH

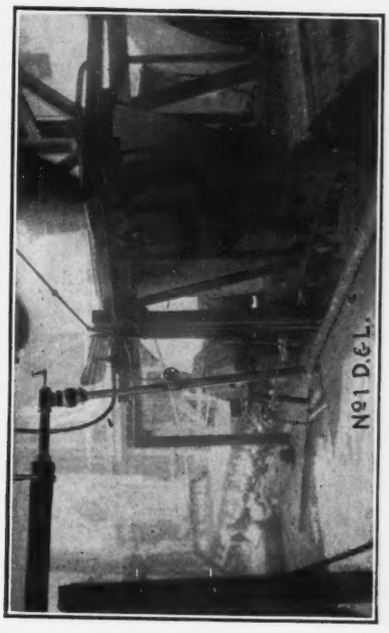

LEAD ANODE MACHINE


LEAD FCE. HOOD

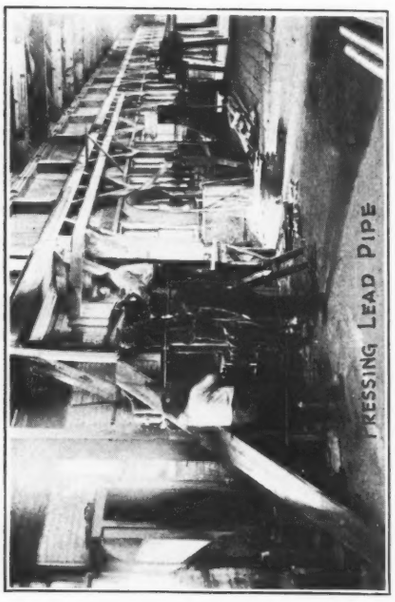

LEAD FCE. SETTLERS

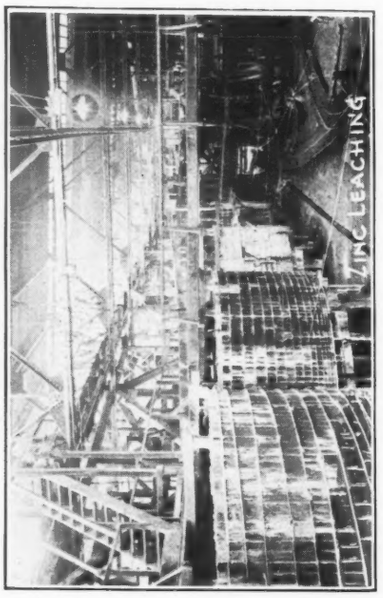
CASTING LEAD PIGS

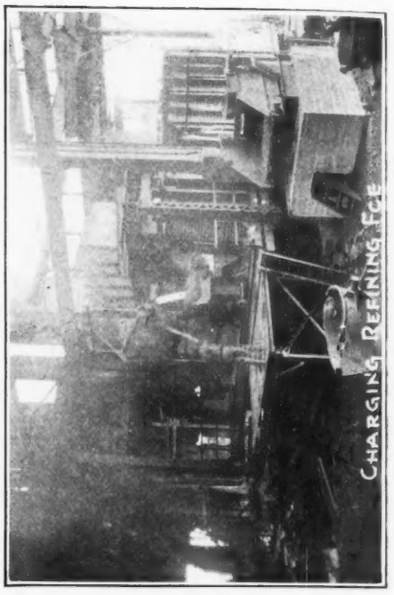

TAPPING LEAD SLAG

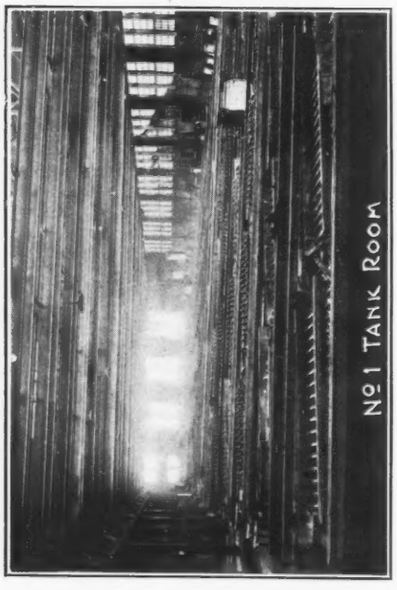

No 1 D.E.L.

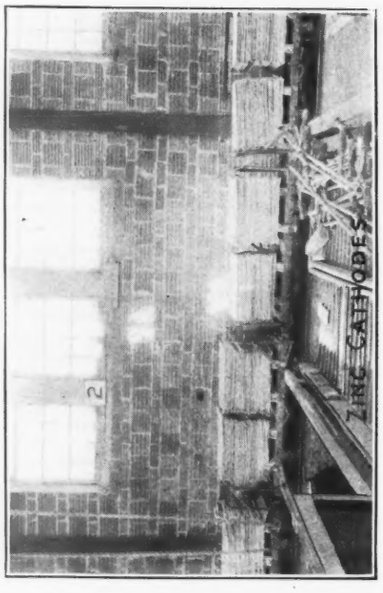
H & H POTS

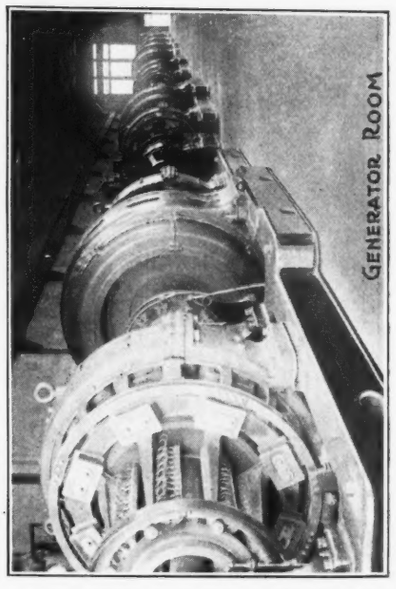

PRESSING LEAD PIPE

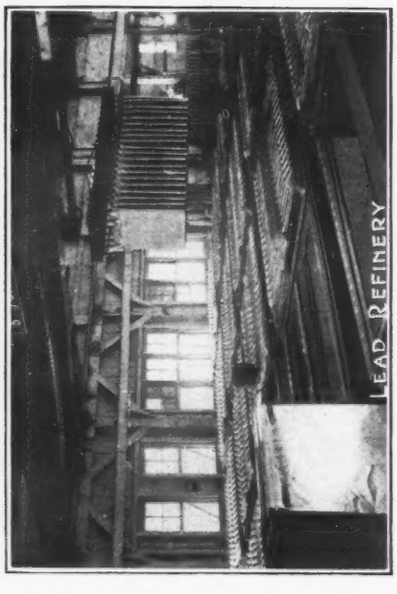

ZINC LEACHING

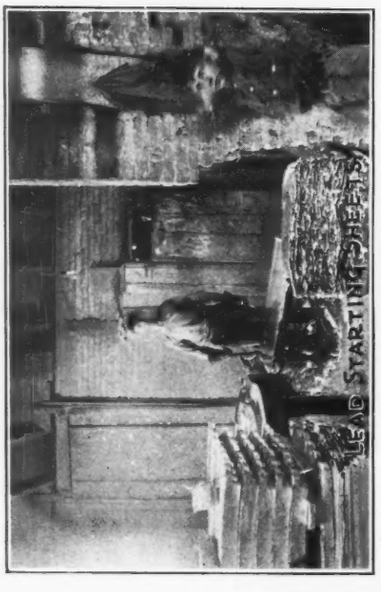

CHARGING REFINING FCE

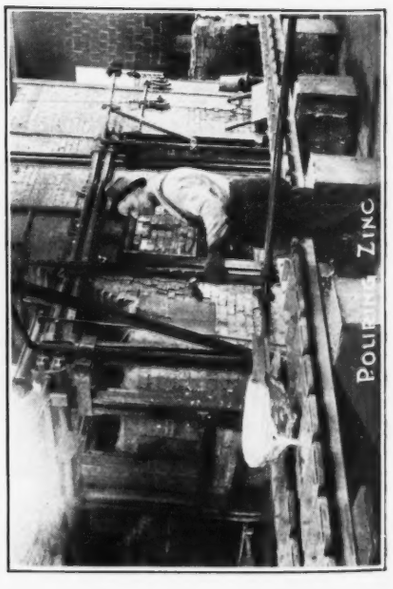

No 1 TANK ROOM


ZINC CATHODES


GENERATOR ROOM


LEAD REFINERY


LEAD STARTING SHEETS


ZINC

intermediate products are readily handled. The waste products are lead and copper slags, waste gases, and concentrator tailings. The plant is noteworthy for the general use made of Cottrell treaters which handle the gases from the copper converters, the Dwight & Lloyd sintering machines, the zinc-blende roasters and the lead blast furnaces. As with other smelters, the Consolidated has a fume problem; the farmers in the vicinity having started litigation. The company appears to have done all that can be done and the litigation has reached a point where an equitable settlement appears likely.

The smelter is especially well equipped with repair facilities. These consist of a foundry, a machine shop, a forge and plate shop and a woodworking shop. The company undertakes large repair work and makes many of the machines and appliances used in its operations. Much of the success of the company is due to the maintenance of a research laboratory and the development of a staff of research men who are given both facilities and incentive to investigate the technical problems that arise.

The courtesy that Mr. Blaylock and his assistants extended to me is acknowledged. The company maintains a broad policy and shares the results of its experiences with technical men in a liberal spirit.

Mining Along the Alaska Railroad

The Alaska Railroad, on which the last piece of steel has recently been laid to complete the line from Seward to Fairbanks, traverses a region rich in mineral wealth, says the U. S. Geological Survey. The new railroad directly serves the mining interests of Kenai Peninsula, the Susitna and Matanuska valleys, and the central part of the Yukon basin, and will also improve the accessibility of the entire Yukon basin. The mines of the vast inland region of Alaska that is now directly or indirectly served by the railroad have, under the primitive conditions of transportation that have existed in the past, produced minerals worth $150,000,000.

In 1922 the territory immediately tributary to the railroad produced $2,034,210 worth of gold, silver, coal, and a little lead, copper, and tin. Indirectly the railroad serves a much larger mining region, which in 1922 produced over $3,000,000 worth of minerals.

On leaving the coast the railroad traverses Kenai Peninsula, where gold mining has been going on in a small way for twenty-eight years. At Anchorage it is only a short distance from the Willow Creek lode district, which in the last decade has produced over $2,000,000 worth of gold. A branch line provides transportation for the high-grade coals of the Matanuska field. The production of coal in this field has already had a stimulating effect on the development of other mining districts. The Yentna placer district, which produced by hydraulic and dredge mining $223,000 worth of gold in 1922, is accessible by a 60-mile wagon road from Talkeetna station. Between Anchorage and Broad Pass there are undeveloped copper deposits within 10 to 20 miles of the railroad.

The railroad also traverses the western margin of the large Nenana lignite field, whose lignitic coal reserves are estimated at over 9,000,000,000 tons. This field is the chief source of fuel for the great inland region of Alaska, and its development, because of the railroad construction, has already stimulated placer mining in the near-by districts.

About 60 miles west of the railroad lies the Kantishna district, where placer mining in a small way has long been practiced.

The district around Fairbanks, the railroad terminus, has since the discovery of gold there in 1903 produced $73,686,976 worth of minerals, chiefly from the placer mines. Lode mining in a small way has been going on since 1910, but has been hampered by the high cost of transportation and the lack of coal. This situation has been changed by the building of the railroad. In 1922 the Fairbanks district produced $752,273 worth of minerals, and mining is now on the increase. Tungsten, antimony, and silver-lead lodes, as well as gold, have been mined in this district.

There are also a number of small placer districts directly tributary to the railroad, including the Valdez Creek district east of Broad Pass; the Bonnifield district, traversed by the railroad; and the Hot Springs and Tolovana districts, accessible by boat and wagon road from Fairbanks. The Hot Springs district contains tin deposits of promise.

Tin Mining Prospered in Federated Malay States During 1922

C. E. Greig, acting Senior Warden of Mines, Federated Malay States, in his annual report states: "The gradual rise in the tin price, combined with a considerable rise in that of rubber and the general recovery of trade, especially in America, all tended to make conditions at the end of 1922 very different from those at the end of 1921. The price of tin at the end of the year was satisfactory, and it is hoped, for the sake of the stability of the industry, that no great movements in the price will occur. Increased price above a certain figure will lead to increased costs all round."

The labor force employed on mining at the end of the year was 82,195, compared with 86,339 in 1921. About 90 per cent of the employees were Chinese. Labor was cheap and plentiful. The total acreage alienated for tin mining, exclusive of unsurveyed concessions, was 216,561 acres, a decrease of 2,878 acres compared with 1921. The consumption of fuel by the industry amounted approximately to 103,916 tons of coal, 2,640 tons of oil, and 701,137 tons of firewood. Fuel was fairly easily obtained, and the prices ruling for coal were considerably lower, and prices for wood were level with those of 1921. Thirty-four prospecting licenses covering an area of 42,142 acres were issued, but only 458 acres were selected.

The proportion of the total output from lode mining was 6.8 per cent for the year under review, compared with 5.6 per cent in 1921 and 9.6 per cent in 1920. As in former years the bulk of the output from lode mining came from one mine, that of the Pahang Consolidated Co., Ltd., at Sungei Lembing.

Bucket dredges accounted for 15.2 per cent of the total output, this figure showing a slight increase over that for the previous year. At the end of the year there were thirty-three dredges in operation and nine under construction. The number of new dredges proposed to be built in the future, as far as is at present known, is about twenty. More attention is being paid to costs and efficiency in the working of these dredges. Bucket dredging remains the most popular form of mining, but there are indications that the device called the suction-cutter dredge may supplant it.

Outfitting for the Tropics

What to Take Along When Equipping for a Trip

BY A. V. EULICH
Tshikapa, Kasai, Belgian Congo

MEMBERS of the engineering fraternity are found in more odd corners of the globe than those of any other profession. Perhaps they are more adventurous or perhaps they have more opportunity to travel. At any rate, they are very much in evidence in the tropics. Medical science has made such rapid strides in recent years in the control of "fevers," that even the most timid spirit may now venture to the tropics without a qualm. Although life is less precarious than formerly, conditions are so entirely different that it is imperative for the prospective traveler to seek advice in the selection of his personal outfit. It is not an easy matter even for the initiated

Prospector's camp in Belgian Congo

to equip themselves for a sojourn of a year or more in the tropics. They usually arrive only to discover that they have overlooked some essential article. For the uninitiated, a still greater problem is presented, and unless they are conversant indeed with tropical life and outfit accordingly, they will subject themselves unnecessarily to hardships and privation.

Unfortunately, friends who have had tropical experience are rare. If available, however, their suggestions are invaluable. Books of travel are sometimes a source of information, but as a rule they deal largely with more general topics and not with means employed to cover one's nakedness and protection used against insect pests. Large companies operating in the tropics frequently send to their new employees a list of clothing and toilet articles, which they suggest be purchased, but there is usually too small a margin of time between receiving the list and the date of departure for it to be of much value. Furthermore, the lists might be criticized as lacking in explanatory detail.

Four important considerations influence the selection of an outfit: climate, nature of employment, manner and means of transportation and the civilized population. It must be remembered that altitude as well as latitude affects temperature. Temperatures which prevail on the coast are at great variance with those in the interior on higher ground, even on the equator. The seasons are classified as rainy and dry and are of nearly equal duration. The rainy season is also one of intense heat. Tropical nights are usually cool and sometimes actually cold. A person engaged for field work would obviously need more rough-and-ready clothing than an office man. In a rough and inaccessible country where transportation is difficult, equipment and supplies must be reduced to a minimum. The presence of cities would influence the selection of articles of sport.

Having participated in many a nocturnal battle with mosquitos, bedbugs, and fleas in nondescript hotels and on board small coast and river steamers, I have solemnly vowed to carry with me always in the future a camp cot, completely equipped with a mattress, pillow, blankets, linens, and a mosquito net and frame. Whether at home, on board ship or during a journey on land, it is unwise to be without a mosquito net around one's bed, for without it no one is safe from insect bites and the diseases they may convey. Mosquitos may carry malaria, filiariasis, yellow fever, dengue, and possibly other diseases; fleas may inoculate the system with plague; the bite of a tsetse fly may transmit sleeping sickness; and sand flies may cause "sand fly" fever, besides inflicting torment rivaled only by the tortures of the Spanish Inquisition. Mosquito boots should be worn to protect the ankles from bites. Without them it would be impossible to enjoy the evenings. But every other form of protection against "fever" is secondary to that afforded by a net. The mesh should be of not fewer than sixteen holes to a linear inch.

In Africa, the sun is another menace to be reckoned with. Why the sun's rays should be more dangerous in Africa and India than in the American tropics cannot be easily explained. But it is a well-known fact that to go about in the African tropics without a sun helmet would mean for most people sudden death, while in the American tropics, panamas and straw hats are worn with seeming immunity. Sun helmets are not uncomfortable to wear nor hideous, and are the best protection known against the actinic rays of the sun, so any prejudice against them is folly. They should be worn continuously between the hours of 8 a.m. and 4 p.m. In the early morning and late afternoon, a broad-brimmed Stetson might be substituted. Persons of advanced age or those inclined to fleshiness sometimes wear, as a further protection against sunstroke, a spine pad lined with red flannel.

Clothing worn in the temperate zones during the summer months can also be worn in the tropics. Palm Beach and white duck are the best suiting material. Khaki trousers or riding breeches and leather puttees are best suited for work in the bush or while on the trek. Shoes are an important item. The U. S. Army models are perhaps the best for most purposes. Some white shoes should also be taken for city wear. Cheap cotton socks are more practical than more expensive kinds, as they may be discarded when holes appear. White cotton or khaki-colored shirts with collars attached give good service. A first-class rain coat should be chosen, for during the rainy season it will be used every day. It must above all things be rainproof. A plentiful supply of athletic underwear and handkerchiefs must not be forgotten. If the departure is made or the return voyage contemplated during the winter, it will be necessary to provide oneself with winter clothing as well. There will be many an occasion when a needle and thread and extra buttons will come in handy.

Tooth paste has the disadvantage of drying out in a hot climate and therefore dentrifice in a powder

form gives more satisfaction. The average person wears out about six tooth brushes a year. As barber shops are not always at hand, hair clippers and scissors as well as shaving articles and supplies are necessary for the preservation of a neat appearance. Talcum powder is a great help in the alleviation of prickly heat. A few bars of good soap, that can be used for hair shampooing, might also be taken. It is recommended that all steel articles such as razors, scissors, and other like implements should always be kept carefully greased, otherwise they will soon become unsightly with rust and unfit for use.

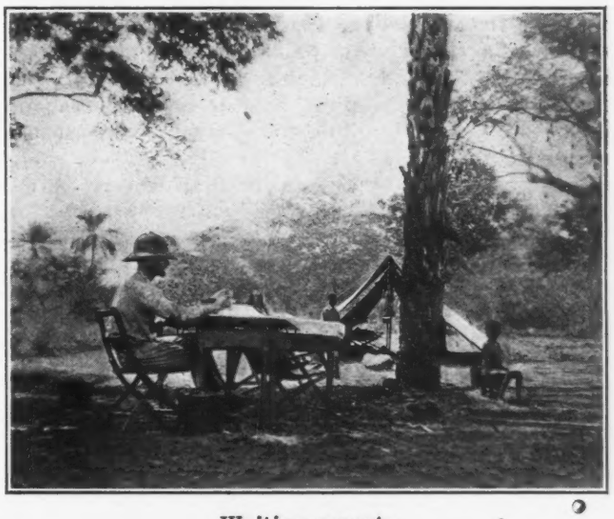
The work of an engineer often carries him far from a place where medical attention might be available. Especially in malarial districts of the tropics, where it is necessary to dope oneself daily with quinine, the purchase of a small medicine case or chest is most advisable. Above all other things, it should contain a liberal supply of quinine bisulphate, hydrochloride and sulphate in 5-gr. tablet form. It should also contain a purgative, tincture of iodine, corrosive sublimate, phenacetin, a clinical thermometer, catheter, lancet, surgical needles and thread, bandages and dressings. Smallpox and typhoid fever are so prevalent in tropical countries that travelers should be protected by vaccination before starting on their journey.

A small technical library is almost indispensable. It would be impossible to suggest a list suitable for all, but those books which have been consulted most frequently in the past are clearly the ones to take. Nor would it be amiss to take along a few volumes of classical literature. This library should be packed in a zinc-lined wooden box or in an iron trunk. It might also be well before starting on the journey to subscribe for a few periodicals. A technical, a general, a fiction and a current event magazine should furnish sufficient reading matter and keep one in touch with outside happenings.

Most engineers learn early in their careers the advantages of a typewritten over the handwritten sheet. Typewritten reports command much more attention than those penned in longhand, no matter how neatly written. Typed correspondence has a business-like appearance. Men of affairs are too busy to decipher a handwritten letter. Even for personal correspondence, typewriting is becoming more and more popular. Whether in the tropics or in the arctics, a portable typewriter is one of the most essential features of an engineer's personal equipment. There are several well-known portable machines on the market, all equally satisfactory. Some good bond paper and envelopes, duplicate sheets, carbon paper, ribbons and machine oil complete the list of typewriting accessories.

A report illustrated with photographs gives an impression of completeness which might otherwise be lacking. A kodak enables one to record permanently impressions of strange scenes, places and people. Because of their proportions, those kodaks designated as 1A, 2C, and 3A recommend themselves. The 1A size is quite large enough and is slightly cheaper to operate than the larger sizes. To be more specific, a folding 1A kodak, having an anistigmat lens and a leather carrying case, is suggested. Developing with a film tank is extremely simple. The film cartridges are best preserved in soldered tin containers. The supply of chemicals and films can be replenished from time to time by prearrangement with a firm in the United States or a near-by city.

Life without music would be a dull existence indeed. A portable phonograph is the best possible guarantee against homesickness and blues. A good one is less liable to give trouble than one of cheaper manufacture. Unless records are chosen with extreme care, it may serve to drive the hearer to distraction instead of acting as a sedative. Records of the latest popular or jazz music should be strictly avoided. Only those which have stood the test of time should be selected. Fifteen or twenty of such records are quite sufficient. They may be packed in a portable record case and both



Writing reports

they and the phonograph should always be carried as hand baggage. A supply of tungsten needles too must not be forgotten.

If stationed in a city or a large mining camp, there may be an opportunity to play tennis or golf, and the accoutrements for playing these games would in such an event be necessary. It might also be possible to obtain smoking supplies if a city is near. On the other hand, if the country to be visited is wild, firearms will be equally useful. Most hunters agree that a 7.9-mm. sporting model Mauser is the best rifle for all-round purposes. It is not a heavy gun, but still large enough to kill the biggest game. A double-barreled 12-gage shotgun will also help provide the camp with fresh meat. A revolver or automatic pistol, although it may be unnecessary, imparts a sense of security. An effort should be made to keep the ammunition in a dry place.

Fiber trunks do not stand up well under the ravages of white ants or the warping and cracking effect of dampness and intense heat. Everything should be packed in small sheet-iron moisture-proof trunks. There are manufactured also trunk bath tubs. These are nothing more than a small tub provided with a wicker basket, in which clothes may be packed and can thereby be easily removed when the bath is wanted, and covered with a lid. Trunks and a bath of this description are inexpensive and will prevent one's outfit from becoming mouldy or ruined by insects. Iron hat boxes are also made in which to carry sun helmets.

If the person about to leave for the tropics follows these suggestions and supplements them with his own judgment, he will find that comfort and pleasure are not entirely unknown in these regions, even though insect pests are numerous, weather conditions not always desirable, and companions sometimes few.

Mining in Early England

Glimpses of the Industry in the British Isles—Tin and Lead in Roman Times—Rise of the Stannaries in Cornwall—Iron Mining

By H. H. Manchester

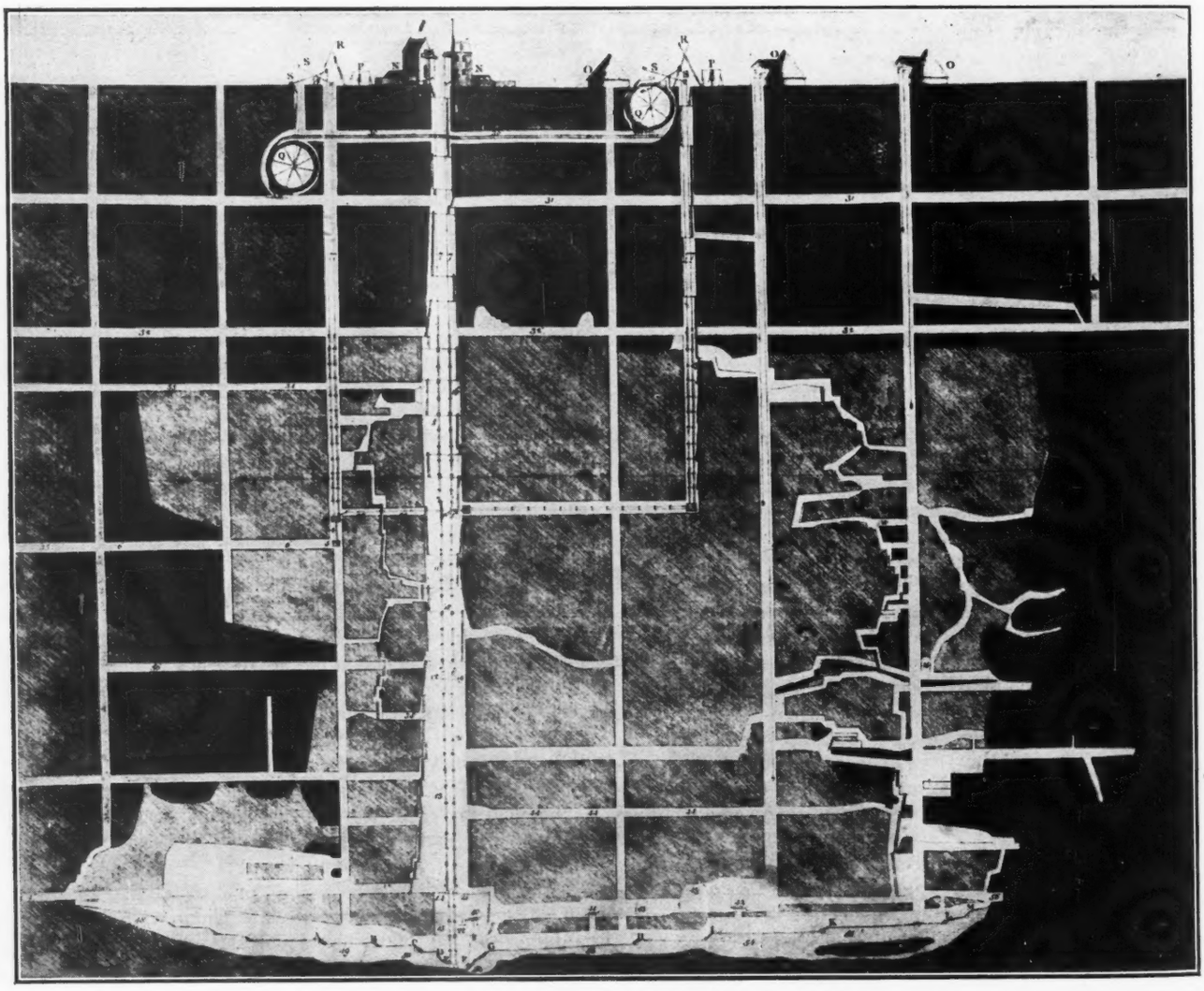
THE HISTORY of mining and metallurgy in England begins even before the Roman occupation of the country. There is some evidence that this was one place from which the Phoenicians obtained the tin which was necessary to the production of bronze; for, all through the Greek and Roman period, although iron and steel were manufactured, bronze was still used for defensive weapons, and, to a wide extent, for household articles and objects of art.

Diodorus Siculus, writing in the first century, B. C., gives this account of the production of tin there:

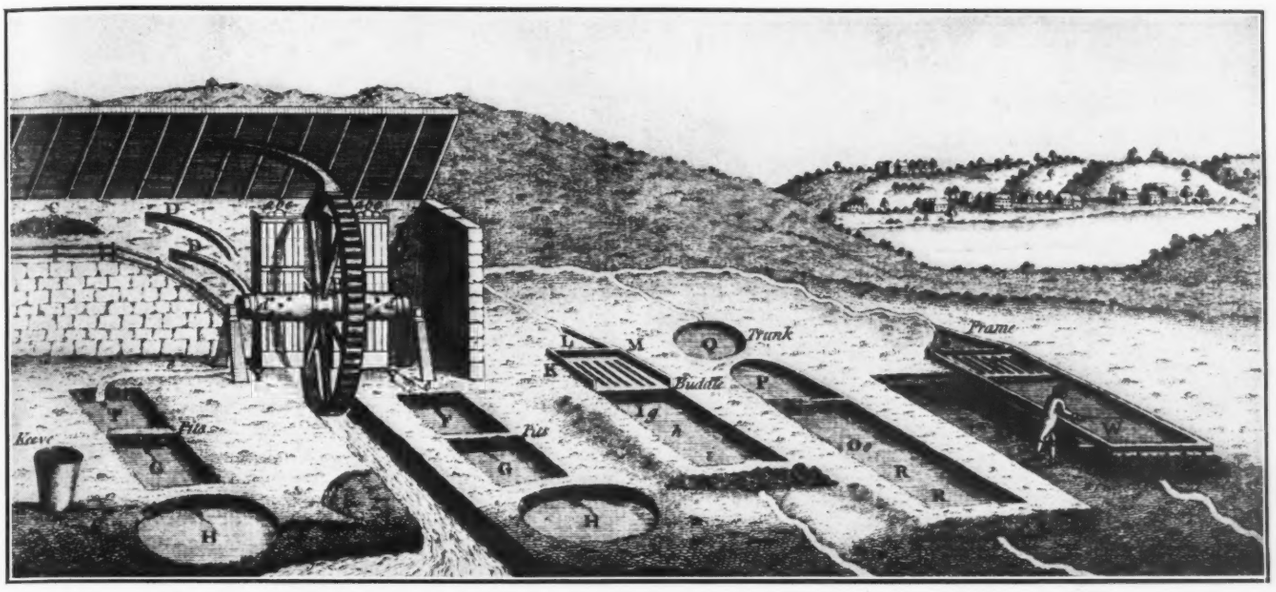
"The inhabitants of that extremity of Britain which is called Bolerion, both excel in hospitality, and also, by reason of their intercourse with foreign merchants, are civilized in their mode of life. These prepare the tin, working very skilfully the earth which produces it. The ground is rocky, but it has in it earthy veins, the produce of which is brought down and melted and purified. Then when they have cast it into the form of cubes, they carry it to a certain island adjoining the Britain, and called Iktis. During the recess of the tide the intervening space is left dry, and they carry over abundance of tin to this place in their carts. And it is something peculiar that happens to the islands in these parts lying between Europe and Britain; for at full tide, the intervening passage being overflowed, they appear islands, but when the sea retires a large space is left dry, and they are seen as peninsulas. From hence, then, the traders purchase tin of the natives, and transport it into Gaul, and finally traveling through Gaul on foot, in about thirty days they bring their burdens on horses to the mouth of the river Rhone."

In this description the semi-island called Iktis is probably Insula Vectis, or the Island of Wight, which corresponds closely to the account.

In Roman times both lead and tin were considered lead, but tin was distinguished by being called "white lead," though this color did not apply to the ore.



Bullen Garden tin mine, eighteenth century



Old plate demonstrating preparation of tin in eighteenth century

Pliny, in the first century A. D., gives us the interesting information that the coating of copper with tin had been invented in Gaul, presumably since its conquest by Caesar. This probably occurred at some point during the transport of the tin from Britain to Rome:

"It was in the Gallic provinces that the method was discovered of coating articles of copper with white lead (tin), so as to be scarcely distinguishable from silver; articles thus plated are known as *incoetilia*. (Literally inboiled, or coated by immersion in the melted tin.) At a latter period the people of the town of Alesia began to use a similar process for plating articles with silver."

It is rather remarkable how few relics of Roman commerce in tin have been found in Great Britain. Almost the only large piece discovered was buried in the bottom of a river. It is, however, of a curved form such as might fit into the bottom of a boat, or into saddle-bags for the back of a horse.

In the case of lead, however, the Roman remains discovered have been numerous and indubitable. One of these lead pigs had on it the stamp of the Roman Emperor Britannicus, 44 to 48 A. D., and another that of Claudius 49 A. D. Pliny wrote concerning it:

"Black lead is used in the form of pipes and sheets. It is extracted with great labor in Spain, and throughout the Gallic provinces. But in Britannia it is found in the upper stratum of the earth in such abundance that a law has been spontaneously made, prohibiting anyone from working more than a certain quantity of it."

Roman lead pipe has also been discovered, which was formed by rolling and melting together the edges. Another use for lead at the time was in funeral urns, for which it was valuable because of its indestructibility by rust or the elements.

The Romans also worked iron mines in Great Britain, and several of these with shafts and adits, as well as cinders and slag from the smelting, have been found. A simple type of Roman smelter consisted merely of a hole on the side of a hill to receive the wind, and a small hole at the top to aid the draft. Aviconium, near Ross, seems to have been a center for smelting and forging. Here no doubt the Roman stack furnaces were employed, but no remains of them have been discovered.

It may surprise one to learn that the Romans in Britain even mined and made use of mineral coal. Supplies of this, as well as ashes from it, have been unearthed along the Roman wall, and in Durham and in Shropshire. In the third century A. D. Solinus mentioned stone balls of fire which were burned in the temple of Minerva at Bath. This use of stone coal is the more remarkable, because the knowledge of its possibilities was practically lost during the barbarian invasions, and until centuries afterward.

In the Saxon period the evidences of mining in England supply few important facts. In the life of St. John of Alexandria, about 616 A.D., there is a statement that an Alexandrian galley made its way to Britain for a load of tin. There are also Saxon remains of tin mining in St. Anstell, but the industry was not mentioned in the Domesday Book at the end of the eleventh century, and could not have been of much importance.

Iron mines were worked more extensively by the Saxons. In 689, Oswy, King of Kent, made a grant of land at Liminge in which there was known to be an iron mine. The Domesday Book listed as taxes thirty-six dicres and one hundred rods of iron from Gloucester, ninety blooms from Pucklechurch, as well as other items.

In 835 a lead mine in Derbyshire was leased from the Abbess of Repton, but at that time the metal seems to have been little used. After the Norman conquest, mining in England seems generally to have picked up.

The lead miners had various privileges. They could prospect anywhere except in churches, gardens, orchards, or highways, and had rights of entry and exit. At Mendips, which probably came from "mine deeps," claims might be fixed by the distance to which a miner could throw his hack, or small pick, weighing about four pounds. In Derbyshire a claim was twenty-four feet. The lead miners had their own courts, to which alone they were subject, and were taxed as miners, and not as subjects of any overlord or district.

The tin miners had similar privileges, and practically the same rights of prospecting. At the end of the twelfth century the tin ore was broken, cleaned, washed with buddles, and smelted twice—the first time near the tin field, and the second at refineries. In 1201 the stannaries received a charter confirming their rights. Fourteen years later the output was about 600 tons, which was not so little, considering the methods employed.

In the thirteenth century the mining of iron notice-

Medieval iron furnaces on a hillside to increase draft.

ably increased, and there were sixty bloomeries in the Forest of Dean, as well as important mines in Sussex and Kent. Smelters which were merely holes on the edges of wind-swept hills were still employed, but hand and foot bellows had already come in. The product was of course not melted iron, but a fused lump.

Mineral coal was again coming into use in the thirteenth century, and we read of a trench dug for sea-coal. It was used in lime burning, but was not adapted to smelting for some centuries.

About 1297 some of the lead mines borrowed from the stannaries the idea of adits for draining, and they were said to have doubled the amount of work done in the mine. At that time the ore was broken by hammers and washed, with the aid of women, in buddles, or in troughs with sieves. The smelter was at first a bole much like a lime kiln, with brush-wood for fuel and the only blast furnished by the wind.

There is an important notation, however, in the Pipe Rolls for 1295 A. D. of a water mill in Devon being employed to blow a bellows. If this is properly interpreted, it is perhaps the earliest record of such an application. By this time smelters in the form of blacksmith forges had come into use, and were especially adapted to be blown by bellows.

It had already been discovered that the lead was likely to contain a percentage of silver. At the end of the thirteenth century the silver was extracted by cupellation with bone-ash or oak bark to absorb the litharge produced from the lead. In smelting for silver a sample six shillings in weight was taken out as soon as the lead was melted. Half of this was given to the king, and half retained by the refinery in order to determine the amount of silver to be extracted from the smelting.

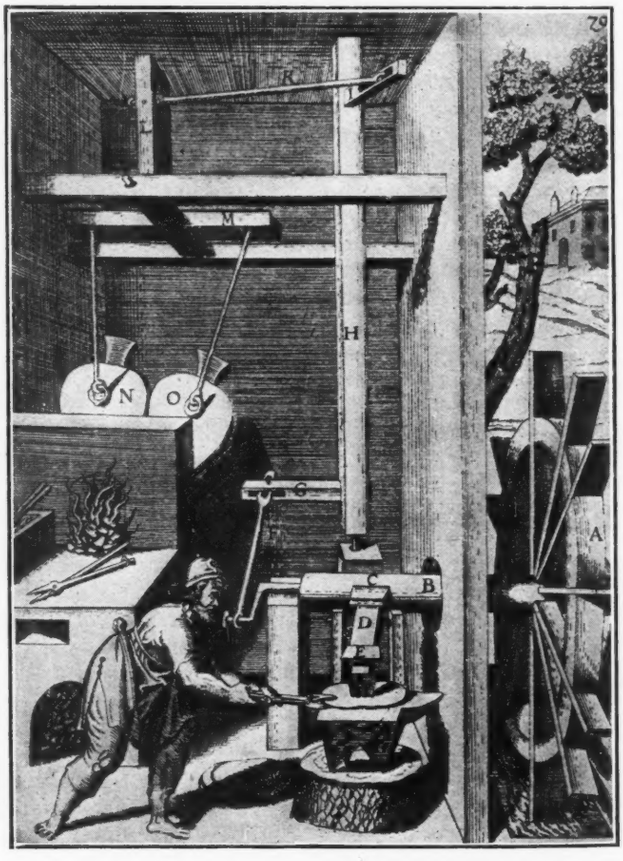
In 1300, the stannaries reverted from the Earls of Cornwall to the crown. At that time the miner had to pay from one-fifteenth to one-tenth of his product for his privileges. Tin had to be sent to specified towns, where it had to remain until assayed and taxed, which took place twice a year. The objection to this arrangement was that only large companies could wait so long before marketing their tin.

In the fourteenth century, iron ore was obtained chiefly from open-cast mines, or from others in which the bottom was widened out like a bell as far as was safe, and sometimes farther. Such mines were occasionally abandoned and became dangerous, for which reason there was a law that they must be filled in when work in them had ceased.

An interesting manuscript minature of about 1340 shows a small forge blown by bellows trodden by a man, while women smiths worked over the products.

Use of water for driving bellows in smelting iron came in at least as early as the fifteenth century. An important record is that of a trip hammer being run by water at Ashdown Forest, Sussex, in 1496. This was of great importance in beating the lump from the bloomery, as well as in subsequent forging. The weight of the bloom might be some 200 lb., though this differed greatly in various localities. By that date the stack furnace had been introduced. This increased the possibilities of heating, and of producing molten and cast iron. At first the molten iron was run off into a long oval with little protuberances at the side which somewhat resembled a sow with pigs, from which they were named.

In the sixteenth century the stannaries became of great importance, partly on account of the demand for bronze cannon and mortars. In 1602 Richard Carew

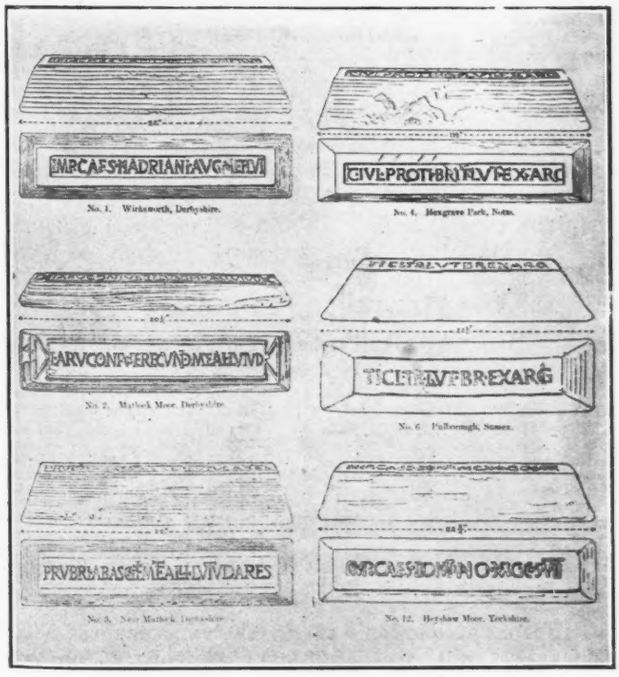


Forge and trip hammer run by water-power, about 1660

Sixteenth-century stamp mill

wrote a Survey of Cornwall which gave a good account of tin mining there. His description of the way in which the miners followed the ore runs in part:

"If the load lie right downe they follow it sometimes to the depth of fortie or fiftie fathom. These load works, Diodorus Siculus 1.5, cap. 8, seemeth to point at where, he saith, that the inhabitants of Valerium Promontine digge up tin out of rockie ground. From some of their bottoms you shall at noondayes discrie the starrs; the workmen are let downe and taken up in a stirrup, by two men who would winde. If the load lie slopewise, the tynners digge a convenient depth, and then passe forward underground so far as the ayre will yield them breathing, which, as it begineth to faile, they sincke a shaft downe thither from the top to admit a renewing vent, which, notwithstanding, their work is most by candlelight."



Roman pigs of lead with various stamps, found in England at the places designated

There was always a struggle for drainage, as is indicated by Carew's statement:

"For conveying away the water they pray in aide of sundry devices, as Addits, Pumps, and Wheeles, driven by a streame. . . . Sundrie places are given to keepe men and some-wheres horses also at worke both day and night without ceasing."

After the ore was brought to the surface, it was taken to the stamping mill, where, according to Carew "three and in some places sixe great logges of timber bound at the ends with yron and lifted up and downe by a wheele driven with water, do breake it smaller."

The next step was the crazing mill, "which, between two grinding stones, turned also with a water wheele, bruiseth the same to a fine sand." This sand was washed on green turf with the aid of a small stream, and panned in a flat wooden dish. "Some of later times," says Carew, "do cause certaine boyes to stir it up and downe with their feete."

It was finally carried to the blowing house, where, in the words of Carew, "the same is melted with charcoal fire blown by a great pair of bellows moved with a water wheel, and so cast into pieces of a long and thicke squareness, from three hundred to four hundred pounds weight, at which time the owner's marke is set thereon." He states that so many particles of tin were carried to the thatched roof of the blow house that

Forge of about 1340 A.D. with women workers

every seven or eight years it paid the smelters to burn down the house for the sake of the tin it contained.

An account of tin mining in the "Transactions" of the Royal Society for 1671 discloses no great advance. An interesting detail was that prospecting for tin was most successful after a heavy rain, by which there were "some new frets made in the sides of the banks."

Iron smelting in 1678 in the Forest of Dean was accomplished by means of a furnace about 24 ft. square on the outside, and 30 ft. high. The interior ground plan was a narrow oval with openings at both ends. There were two bellows driven by water, and the iron was melted and cast.

Early in the eighteenth century tin mines were dug much deeper and the lode was followed by means of various galleries. This may be seen in a representation of the famous Bullen Garden mine, in Cornwall. At the same time, as suggested by another engraving, the smelting was done on a much more extensive scale.

Journal-Press Index Ready

The index of Vol. 115 of the *Engineering and Mining Journal-Press* for the first half of the year 1923 is now ready for distribution and will be sent to all requesting it. A post card will do.

THE PETROLEUM INDUSTRY

Outlook Good for New Oil Development in Dutch East Indies

There are several known but yet undeveloped oil-bearing areas in the Dutch East Indies, according to Alfred T. Coumbe, Jr., in Trade Information Bulletin No. 111 issued by the Department of Commerce. The larger of these is the Djambi field, in the residency of the same name, in central Sumatra. A large number of anticlines have already been mapped in this district, and it is considered to be the most promising of future fields. An American and several Dutch companies negotiated with the colonial government over a period of several years concerning the granting of concessions in the Djambi area, but the question was not settled until late in 1921, when the final award was made to the Bataafsche Petroleum Maatschappij. The grant, amounting to 4,312,620 acres, is in the name of the Nederlandsch Indische Aardolie Maatschappij (Netherlands Indies Mineral Oil Co.), which has a capital of 10,000,000 guilders. This company has 10,000 shares, of which half are owned by the Dutch colonial government and the remainder are the property of the Bataafsche Petroleum Maatschappij, the operating company of the Royal Dutch. Uncertainty as to future taxation methods has retarded actual developments, but drilling on an extensive scale is expected soon.

Farther to the northeast is still another prospective petroleum area known as the Siak field. It lies along a river of the same name in the southeastern portion of the Oostkust Residency of Sumatra. Very little of the geology of the section is known as yet, so its value as a future field is more or less speculative.

The colonial government, working through its "mining service," has been carrying on survey and exploration work in the Atjeh Residency to the west and north of the present Perlak area, but conditions were found to be unfavorable. Other investigations of this nature were made to the south and east of the Atjeh field, with results that indicate the extension of the petroleum-bearing formation in that direction.

During 1922 a new field was discovered on Boenjoe, a small island near Tarakan and off the northeast coast of Borneo. The petroleum sands are believed to be a continuation of the extensive Tarakan field.

The geological formation of the Borneo coast opposite Tarakan, as well as the territory north of Samarinda, is believed to be favorable for the retention of petroleum in commercial quantities, but up to the present nothing has been done here beyond preliminary surveys.

Likely geological structures and even actual oil seepages are also known to exist in various parts of Java outside of the present producing areas as well as in other islands of the colony. Most of these possible fields, especially those outside of Java, will probably not be developed for a number of years, because of the remoteness of these places from centers of civilization, a tropical climate that is generally unhealthful for the white races, and the unwillingness on the part of the natives to hire out as laborers. This labor question does not exist in Java, as here there is a 35,000,000 population to draw upon and, furthermore, the Javanese will work. In the other islands of the Archipelago the natives are not so numerous; besides, in Sumatra they are too well off or too proud to do coolie work, while in Borneo, Celebes, and New Guinea the scattered tribes are still primitive and, generally speaking, avoid the white man and his ways. This difficulty of finding local labor in these outlying islands—which makes it necessary to import contract coolies from Java, China, or British India—is and will continue to be an important factor tending to delay for a number of years the development of many of the Dutch East Indian prospective fields.

Because of climatic conditions that are rather severe on the white race, and the thick, almost impenetrable tropical jungle that blankets most of the islands, the nature of the underlying strata is practically unknown, except in the present commercial fields and their immediate vicinity. This lack of geological knowledge based on comprehensive surveys makes a calculation of the possible petroleum reserve of these colonies a most difficult problem. Dr. David White, of the U. S. Geological Survey, believes that a total of 3.2 to 4 billions of barrels is a conservative estimate for the amount of petroleum still in the ground in the Dutch East Indies and Papua.

Weekly Estimate of Petroleum Production Shows Increase

The daily average gross production of petroleum in the United States for the week ended July 14 was 2,238,750 bbl., compared with 2,199,150 bbl. for the preceding week, an increase of 39,600 bbl, according to the American Petroleum Institute. The daily average production east of the Rocky Mountains was 1,370 750 bbl., compared with 1,364,150 bbl., an increase of 6,600 bbl. The following table gives estimates of daily average gross production for the weeks ended July 14, July 7, 1923, and July 15, 1922:

Daily Average Production of Petroleum

In Barrels

	1923		1922	
	July 14	July 7	Difference	July 15
Oklahoma	503,850	495,700	Inc. 8,150	408,000
Kansas	84,650	84,800	Dec. 150	84,600
North Texas	75,550	74,050	Inc. 1,500	49,300
Central Texas	175,250	165,500	Inc. 9,750	129,950
North Louisiana	62,500	65,100	Dec. 2,600	94,650
Arkansas	122,500	141,300	Dec. 18,800	32,550
Gulf Coast	102,150	98,150	Inc. 4,000	102,150
Eastern	113,900	112,000	Inc. 1,000	116,500
Wyoming and Montana	131,300	127,550	Inc. 3,750	86,750
California	868,000	835,000	Inc. 33,000	370,000
Total	2,238,750	2,199,150	Inc. 39,600	1,474,450

California production was 868,000 bbl., compared with 835,000 bbl., an increase of 33,000 bbl. Santa Fe Springs is reported at 327,000 bbl., against 315,000 bbl.; Long Beach 204,000 against 200,000 bbl., and Huntington Beach 126,000 bbl., against 110,000 bbl.

CONSULTATION

Charges for Refining Copper Matte

"Can you advise me what are the average charges for refining copper matte containing about 50 per cent copper, 1.25 oz. gold, and 30 oz. silver per ton? A mine in which I am interested should have an annual production of about 100,000 tons of ore averaging 45 per cent sulphur, which, after roasting, would give about 70,000 tons containing about 6,000,000 lb. of copper, 5,600 oz. of gold, and 190,000 oz. of silver recoverable. This could be smelted at the mine to about 6,000 tons of a 50 per cent matte, but according to the estimates of a leading custom smelter, the smelting charges on the matte would be about $248,000, to which would have to be added $30,000 to $40,000 for freight, and the refining charge including 3c. per lb. of copper, the net cost being about 4½c. per lb. on the recovered copper. I notice, however, that in several mining companies' returns the charges for refining are under 1c. per lb. of copper on outputs from five to ten times what our mine could produce. Is it only moderate producers that have to pay three times as much?"

Assuming that you would ship your matte to one of the eastern seaboard refineries in the amount stated, they would probably make you a proposition something as follows:

Material—Copper matte containing about 50 per cent copper, 1.25 oz. gold, and 30 oz. silver per 2,000 lb. and understood to be clean matte free from objectionable impurities.

Quantity and Period—About 6,000 tons for delivery over one year beginning July 1, 1923.

Delivery—Free on receiving dock, or f.o.b. car on siding at our works.

Basis of Accounting—Copper by electrolytic assay less 1.3 units would be paid for at the average of the *Engineering and Mining Journal-Press* quotations for standard electrolytic wire bars at New York. Ninety-five per cent of the excess of silver over 1 oz. per 2,000 lb. would be paid for at the average of the New York official quotation for foreign fine silver as quoted by the *Engineering and Mining Journal-Press*. One hundred per cent of the excess of gold over 0.05 oz. per 2,000 lb. would be paid for at the rate of $20 per oz. The price of both copper and silver would be the average of the quotations published during the period of fifteen days following the arrival of the matte at our works. From the values calculated above, we would make the following deductions:

Smelting Charge—$4 per 2,000 lb. of matte, dry weight.

Refining Charge—3c. per pound of copper accounted for.

Selling Commission—1 per cent of the value of the copper accounted for.

Payment—Net value would be due for copper, sixty days; silver and gold ninety days after sampling at our works.

You would hardly get the refining done for much less than 3c. per lb. considering the fact that you are an unknown producer without an established reputation for regular and dependent output, and working on only a small scale. You mention the refining charge for the big companies being less than 1c. per lb. This seems rather low for present conditions, and probably represents refining done under old contracts when prices were lower. In the reports of most companies it is difficult to segregate the refining charge, as it is included with some or all of the following: marketing, freight, concentrating, and smelting. In the last report of the Greene-Cananea, refining and selling amounted to 2.1c. per lb.; at Inspiration, refining, selling and transportation was 2.2c. per lb.; at Miami, smelting, refining and freight was 1.75c. per lb.; and for the Nevada Consolidated freight and refining charges are given as 1.6c. per lb.

The weighted average cost of refining copper was given by a report of the Federal Trade Commission for 1918 as 1.03c. per lb., but conditions then were different from what they are today.

The Danger of Inflation from an Oversupply of Gold

An inquirer writes to the *Wall Street Journal* as follows:

"Will you be good enough to explain to me the effect of the importations of gold into this country?

"I cannot see why the presence of a large amount of gold in this country necessarily spells inflation. Of course, I know gold is one of the bases for the issue of currency by the Federal Reserve system, but am I not correct in my understanding that the issue of currency is not imperative because we hold gold?

"If we had an average amount of wheat and average demand, would not its price, that is its value in exchange for gold, depend on the amount of gold in existence without being affected by the fact that the gold was in New York or in Liverpool or in Paris?"

As many of our readers are also interested in this question, we are publishing the editor's reply:

"Danger arising from presence of an oversupply of gold is more potential than actual, for it does not necessarily mean inflation. Only when the gold is actually placed in circulation, or is used as a reserve against an expansion of credit either by note issue or discounting of bills, in excess of legitimate business requirements, does it constitute inflation. The danger lies in the fact that there is always a temptation to use available gold as a basis for credit. However, the present economic status of this country is proof that there need not be inflation, for no authority can see inflation in our present banking position, and our gold supply is large enough to allow legal expansion of credit to about twice the present volume. The issue of currency is not imperative because of increased gold holdings.

"We cannot take it for granted that existence of a large amount of any commodity means lower prices for that commodity, for the supply has to be made available before it can affect the price. In this case, our Federal Reserve system has been conserving the gold supply. If the gold had been arbitrarily placed in circulation or used as a basis for credit, without a corresponding increase in volume of business or volume of commodities, it would have caused a corresponding increase in prices.

"The answer to your last question is 'no.' Average prices for all commodities with a world market would depend on the amount of currency and credit available in the world, provided there was absolute free trade between nations and disregarding transportation costs and other conditions, and, as in the case you cite, if there was an average amount and average demand for wheat, its price would change accordingly. However, even that does not hold good today, on account of the various foreign trade restrictions, exchange manipulation and other factors.

Recent Technical Publications

Reviews, Abstracts, and References

Ore Concentration—"The Dielectric Constant as a Factor in Ore Concentration" is the subject of a 5-page article in the May *Mining Magazine* (Salisbury House, London Wall, London E. C. 2, England; price 1s.) The dielectric constant of a mineral is a distinct property not connected, so far as ore-dressing considerations are concerned, with any other physical properties except, in some instances, conductivity. The idea of its application is new. Experiment shows that two substances so similar as quartz sand that has been heated to 340 deg. and quartz sand that has not been so treated can be separated by this means.

The principle upon which the experimental machine operates is that if a finely crushed mixture of two minerals be passed through a grating, the parallel bars of which are alternately connected to the two ends of a suitable alternating-current circuit, the mineral which possesses the higher dielectric constant will be attracted, and the mineral which possesses the lower dielectric constant will be repelled from the bars of the grating if the whole is immersed in a medium the dielectric constant of which is intermediate between that of the two minerals. For example, cassiterite (50) will be attracted and quartz (4.5) will be repelled if the grating is immersed in analine (7.3), amyl alcohol (16), or nitrobenzene (36).

Dielectric separation is so far thought to be practicable for (1) the separation of good conductors from bad ones of low dielectric constant, particularly when they are both finely disseminated, such as blende from galena, and metallic silver from gangue. (2) The separation of earthy minerals of low dielectric constant from one another or from their gangue; for example, the oxides of nickel, cobalt, uranium, vanadium, cerium, and thorium. (3) The treatment of tin ores when the cassiterite is finely divided. (4) The separation of heavy mineral particles from a concentrate of some mineral which is a good conductor or has a fairly high dielectric constant; for example, thoria and ceria from tin concentrate, or pyromorphite from vanadinite concentrate.

Unlike every other known process of separation, this method is positive, not differential. One mineral is attracted and the other repelled, not merely attracted less.

Barite and Ocher—In "Barite and Ocher in the Cartersville, Georgia, District" (*Reports of Investigations* No. 2,477, pp. 11) the U. S. Bureau of Mines describes the nature of the deposits and the methods of mining and milling in use. The paper may be obtained from the Bureau on request.

Graphite Mining in Alabama — The Geological Survey of Alabama, University, Alabama, has published the first of a series of reports on the counties of the state. Clay County is discussed in a 200-page bulletin by William Frederick Prouty. Mica, pyrite, and gold have been produced on a small scale, but graphite is the principal mineral resource of the county and and most of the book is devoted to it. The industry is practically dead at the present time, but the deposits of graphite-bearing rock are extensive, and large and costly plants for concentrating the ore were erected during the World War. Mr. Prouty describes the geology of the region and of the deposits; the mining and transportation of the ore; and a dozen different systems of concentration that have proved practicable. Some excellent halftones illustrate the book. A large number of good line drawings are used to illustrate geological features, but they are marred somewhat by freehand lettering that is poorly done.

The Coeur d'Alenes—The U. S. Geological Survey, Washington, D. C., has recently issued Bulletin 732 (pp. 156, obtainable on request), which is devoted to the geology and ore deposits of Shoshone County, Idaho. The report is a valuable treatise on this important district, and it is regrettable that its publication should have been so long delayed, for the field work was done in 1916. The usual excellent maps are included in the report, and the ore deposits of the individual mines are described in detail. As most of our readers know, the district is an important producer of zinc, lead, silver and gold, together with small amounts of copper.

Blende Roasting—In *Metall und Erz*, 1923, Vol. 20, pp. 65-74, 85-91, and 104-107, is a detailed review of all the most important papers published on the roasting of zinc blende and the distillation of zinc from roasted blende since 1900. The publishers may be addressed at Mühlweg 19, Halle on Salle, Germany.

Canadian Mineral Production — The annual report of the Dominion Bureau of Statistics on the Mineral Production of Canada, covering 1921, has recently been issued (pp. 233; available on request from the Bureau at Ottawa). The value of the gold produced was far greater than that of any other mine product with the exception of coal.

Mine Rescue—A description of the mine rescue maneuvers held at Globe, Ariz., in October, 1922, is contained in *Reports of Investigations* No. 2,473, issued by the U. S. Bureau of Mines, Washington, D. C., pp. 5, obtainable on request.

Jarbidge, Nevada — Bulletin 741 of the U. S. Geological Survey, Washington, D. C., 86 pages, obtainable on request, is entitled "The Jarbidge Mining District, Nevada." The district is in Elko County, near the Idaho state line, and is one of the recently developed gold-silver camps of the state. The Elkoro Mines Co., a subsidiary of the Yukon Gold Co., is the principal producer. The camp is 55 miles in an air line from the nearest railroad station at Rogerson, Idaho. The present report is supplementary to that published in 1912 and is based on a two weeks' examination of the district made in July, 1920. Several maps, sketches, and photographs are included.

Canadian Maps—The Topographical Survey of Canada has issued two series of maps, one of the Lower Athabasca and Upper Slave rivers and Lake Athabasca, price 75c. for the set of four; and the other of the Mackenzie and Lower Slave rivers and Great Slave Lake, price $2 for the set of ten. Each set contains a general map on a scale of 50 miles to the inch, and detailed maps mostly on a scale of 4 miles to the inch. The maps show topographical features, navigation routes, settlements and other detail, and may be obtained from the Surveyor General, Ottawa, Ont.

Tennessee Copper Co.—In *Electro Topics* for May (Tennessee Electric Power Co., Chattanooga, Tenn.; free) is an interesting 8-page article describing the operations of the Tennessee Copper Co.

Alaskan Copper — The Kotsina-Kuskulana district, in Alaska, is described in a 149-page report recently issued by the U. S. Geological Survey, Washington, D. C., as Bulletin 745 (obtainable on request). The report is based on work done between 1912 and 1919, the war having interrupted publication. The district is a possible producer of copper, and perhaps also of gold and silver. It is situated near the junction of the Chitina and Lower Copper rivers. Most of the report is devoted to the geology of the district, and is illustrated with maps and photographs.

Mining in Quebec—The Report on Mining Operations in the Province of Quebec for 1922 has recently been issued by the Quebec Bureau of Mines, Quebec, Canada (138 pages; obtainable on request). By far the most important mining industry of the province is asbestos, though feldspar and mica are mined to some extent, and there is active prospecting for the precious metals in the northwestern part of the province. An extended list of the operators and owners of mines and quarries is given in the report.

Treatment of Zinc Residues—"The Metallurgical Treatment of Zinc Retort Residues" is discussed in U. S. Bureau of Mines *Reports of Investigations* No. 2,475, pp. 12, obtainable on request to the Bureau at Washington, D. C. Several methods are given which have been in successful use at various plants, their various advantages being summarized.

SOCIETIES, ADDRESSES, AND REPORTS

Kentucky Geological Survey Active

Numerous Field Parties at Work, According to Recent Report by State Geologist

The work of the present State Geologist of Kentucky, Dr. Williard Rouse Jillson, began in February, 1919. The policy of the director has been to institute economic geological and mineral resource studies, coupled with a systematic development of the stratigraphy of the state. To date, fourteen separate volumes have been prepared and published by the Survey, six manuscripts are in the hands of the printer, and five are now in preparation. The structural geology of eleven counties in the oil and gas producing region of the eastern coal field of Kentucky has been executed since 1919. A state-wide report on the clays and clay industries of Kentucky has been prepared by Dr. H. Ries and published. A reconnaissance of the rocks of the Mississippian System in the eastern part of the state has been completed by Charles Butts, and published by the Kentucky Geological Survey in co-operation with the U. S. Geological Survey.

Detailed stratigraphic and structural quadrangular work has been in progress for three years in the rich fluorspar region of western Kentucky, and two bulletins, one on the Golconda Quadrangle and the other on the Princeton Quadrangle, have been completed by Dr. Stuart Weller, and published by the Survey. The geology of the Cave-In-Rock Quadrangle, lying between these published quadrangles, is now in process by the same author. A bulletin on the geology and coals of Webster County has been prepared by Dr. L. C. Glenn, and published by the Survey. A detailed regional report on the fluorspar deposits of western and central Kentucky has been prepared by Prof. L. W. Currier.

A state-wide examination of the glass sands of Kentucky was made by Dr. Charles H. Richardson, and published by the Survey, and a report on the "Building Stones of Kentucky" by the same author, descriptive of 616 quarries, has been completed.

A comprehensive program contemplating the completion of regional geographic studies in Kentucky has been initiated, and is now drawing to completion. A report on the geography of the Jackson Purchase region in western Kentucky has been made by Dr. D. H. Davis, and is now available. A regional geographic report on the mountains of eastern Kentucky has also been prepared by the same author, and is now in press. A bulletin on the "Geography of the Kentucky Knobs," by Prof. W. G. Burroughs, is now in the press. Detailed studies on the black Devonian oil shales of Kentucky have been made by Dr. Reinhardt Thiessen and Prof. S. C. Crouse.

During the present summer reports on the regional geography of several sections are being prepared. In co-operation with the State Department of Roads and Highways an examination of road-building materials is being made. This work is being done by Dr. Chas. H. Richardson. Prof. A. M. Miller is completing the mapping of the geology of Woodford, Jessamine, and Fayette counties, in the Lexington region, and the report with map will be published during the fall. Detailed studies of the oil and gas structural geology of the eastern coal field of Kentucky are now in charge of James S. Hudnall with a group of assistants.

Mine Taxation To Be Discussed at Milwaukee

The program of the mine tax conference at the convention of the American Mining Congress, to be held at Milwaukee Sept. 24-29, includes an address by Paul Armitage, New York, whose subject will be: "Is a uniform rate per unit of extraction 'reasonable allowance for depletion'?" The other speakers and their subjects are:

W. I. Kirkcaldie, Milwaukee, "Use of retrospective appraisals in determining invested capital, depreciation, and depletion."

Arnold R. Baar, Chicago, "Taxation of dividends and other corporate distributions, with particular reference to distributions from capital, reserves, and unrealized appreciation."

Walter A. Staub, New York, "Reorganizations covering provisions of the revenue law relating to reorganization, merger, consolidation or change in capital stock of corporations, and discussion of values, depreciation and depletion, the effect of stock and liquidating dividends, and status of stockholders with respect to their personal taxes."

H. B. Fernald, New York, "Inventories, their relation to federal taxation of mining companies, their effect on taxable income, valuation bases for materials and supplies consumed in operations, and parts unfinished or finished and sold or unsold, and other aspects in connection with determination of tax liability."

Wade Kurtz, Joplin, Mo., "Profits in a mining venture."

George E. H. Goodner, Washington, D. C., "Discovery value, reasons for its recognition in federal income taxation, and principles which govern its determination."

Favors Employee Representation in Management

Committee of National Economic League Presents Report on Readjustment in Industrial Relations

As the result of a study of over 1,000 plans for improved relations between employers and employees a special committee of the National Economic League on Readjustment in Industrial Relations recommends that employees should be given participation in management under certain limitations and that they should be given the opportunity to acquire some financial interest in the establishments in which they work. The committee concludes that the term "industrial democracy" is misleading and should be abandoned; that employees, as a whole, are not interested in assuming the responsibilities of management; and that, while they should be given the opportunity to have a voice in management on matters affecting their immediate welfare, it would be inadvisable to have them participate in management on questions of policy, such as selling, purchasing, finance, and similar matters. An important point made by the report is that employees and executives should be given more instruction in the economics of business, as a step to better industrial relations.

The subcommittee which prepared the report is made up of the following: Daniel Bloomfield (secretary of the committee), lawyer and consultant in industrial relations; Charles W. Eliot, president-emeritus of Harvard University; and seven other members, representing various industries.

A vote was taken three years ago by the national council of the League on the question: "Should there be active participation by employees or representatives of employees in all problems of management affecting the worker?" The answer was an affirmative one by 78 per cent of the 500 members who voted. The present report aimed to learn what was done in this direction up to the present, and the committee has made an intensive study of the experience with this question throughout the country.

The committee finds that the movement for representation of employees in the discussion and adjustment of working conditions is spreading rapidly, and that, in the majority of cases where such plans have been tried, they have been successful in establishing better relations. With few exceptions the plans in operation give employees advisory powers only, and that, says the committee, seems to be the most practicable method of representation at present.

MEN YOU SHOULD KNOW ABOUT

R. A. Kinzie has returned from Mexico to San Francisco.

John Kiddie, of the Phelps Dodge Corporation at Morenci, Ariz., is on vacation in California.

E. A. Julian, general manager of the Goldfield Consolidated interests, has been in Reno from San Francisco.

G. M. Schwartz, of the faculty of the University of Minnesota, has been promoted to an assistant professorship.

Luc Rochefort, of Montreal, general manager of Credit-Canada, Ltd., has been elected a director of Asbestos Mines, Ltd.

F. E. Salas, organizer and general manager of the International Ore & Smelting Co., has resigned. He is succeeded by **E. Zertuche Garza.**

William Watson, of London, has examined a number of properties in the Ymir district of British Columbia in the interest of a British syndicate.

F. W. Maclennan, general manager of the Miami Copper Co., and Mrs. Maclennan have left Miami for a visit of six weeks in Montreal and other eastern points.

Charles Camsell, Deputy Minister of Mines, is in British Columbia on a tour of inspection of the work that is being done by the Canadian Geological Survey.

William Cooper, formerly superintendent of the Temiskaming mine, of Cobalt, has been engaged to take charge of the work of the Rouyn Gold Mining Co.

D. S. Dean, of Cohasset, Mass., secretary-treasurer of the Keweenaw Association, has just completed a trip to the Michigan mines in which his company owns the fee.

Frank W. Royer, of Los Angeles, has been examining the mineral possibilities of the Lordsburg, N. M., district, accompanied by **James P. Porteus,** of the Bonney mine.

Viscount Mandeville, of London, eldest son of the Duke of Manchester, has arrived in Canada and is on his way to his father's gold claims in the Abitibi region of Quebec.

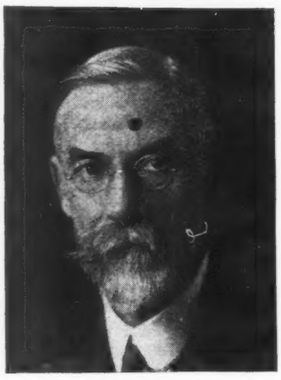
Charles Spearman, manager of the Montreal-Ontario Mines, has been engaged as consulting engineer for the Kirkland Gateway property, formerly the Lucky Cross.

W. A. Paine, of Boston, president of the Copper Range Co., and his son, **F. W. Paine,** a director, are in the Michigan copper district on a visit to the properties of the company.

Alfred R. Whitman, geologist, who has recently been engaged in the University of California, is now investigating geological conditions near Lake Dufault, near Rouyn Township, Quebec.

Frederic W. Schroeder, an analytical chemist in the service of the Bureau of Mines, has been assigned to work at the Seattle station to succeed **J. B. Sullivan,** who has been transferred to Berkeley.

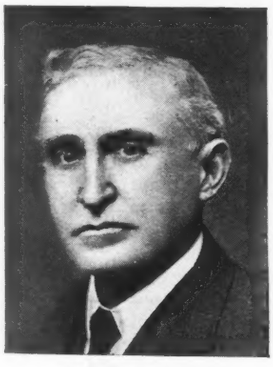
Samuel Evans, chairman of Crown Mines, Ltd., and long and honorably



Samuel Evans
Chairman Crown Mines

associated with the British military service and with the mining industry, has left Johannesburg for a trip to England.

S. W. McCallie, State Geologist of Georgia, is directing the preparation of a report on the brown iron ores of that



S. W. McCallie
State Geologist of Georgia

state and on Georgia's physical geography. The work is being done with the active co-operation of the Federal Government Survey.

Harry Stewart, manager of the Crown Reserve property, has been forced to go on an extended holiday on account of ill health. **Maurice W. Summerhayes** will be in charge of the property until Mr. Stewart's return.

Albert A. Silver, superintendent of mills for the Tonopah Belmont Development Co., who has been ill with pneumonia for the last two weeks, has recovered sufficiently to be moved from Tonopah to the coast, where he will recuperate.

Sydney L. Shonts, mining engineer, has returned to his home in Wallace, Idaho, after serving almost two years in the Bureau of Internal Revenue, Washington, D. C., his special work being in connection with the adjustment of income and excess profits tax due from mining companies.

John L. Retallack has returned to Canada from the West Coast of Africa, where he has been employed for the last two years in the construction of docks and a railway for J. Stewart, Ltd. Major Retallack will now devote himself to his extensive mining interests in the Kootenays.

Arrangements have been made whereby the President's Coal Commission will make use of the services of **Prof. E. A. Holbrook,** of Pennsylvania State College, during the summer vacation. Before taking charge of the coal mine engineering section of that institution, Mr. Holbrook was assistant director of the Bureau of Mines.

Dr. W. D. Bonner, of the U. S. Bureau of Mines, who has been employed as a physical chemist at the Pacific Experiment Station, Berkeley, Calif., has resigned and will return to the University of Utah as an instructor. **C. G. Maier,** formerly with the Department of Metallurgical Research of the University of Utah, has been appointed to the position at Berkeley made vacant by Dr. Bonner's resignation.

Samuel Newhouse, veteran mining operator and promoter, whose name in Utah is connected especially with the development of the Boston Consolidated mine, at Bingham (now a part of the Utah Copper), and the old Cactus mine, at Newhouse, Utah, was the guest of the Salt Lake City Chamber of Commerce at luncheon on Wednesday, July 18. Mr. Newhouse, who has been living abroad, spoke particularly on European conditions.

MEETINGS

The twenty-third annual meeting of the Lake Superior Mining Institute will be held on the Minnesota ranges Aug. 29th to 31st. Headquarters will be at the Spalding Hotel, Duluth.

OBITUARY

General R. G. Edwards Leckie, a mining engineer of prominence in Western Canada, who had an exceptional overseas record in connection with the Canadian forces in the Great War, died recently in Vancouver, his home.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Leading Events

COMMUNITY building project beautifies the Inspiration copper camp in Arizona and adds to the contentment of employees.

Granby will resume operations at Allenby, B. C., Hecla mine fire decreases Bunker Hill's lead production to the output of one furnace.

United Verde Extension makes a fight for lower freight rates from Arizona points to the Pacific Coast.

Colorado's "blue-sky" law becomes effective Aug. 1.

Memorial clubhouse being erected to the late manager of the Utah Copper Co.

Steel work of the Magma smelter has been completed.

Commerce Mining & Royalty Co. in the Tri-State district successfully operates its own insurance department.

Senator Pittman addresses an appeal to the Comptroller General, urging him to reconsider his decision with regard to silver allocations.

Ohio Copper Co. reports low costs from its leaching operations.

Simon Silver-Lead Co. makes a record output.

Colorado Corporation has begun to produce.

Miami Copper distributes the earnings from its company store.

Granby Will Resume Allenby Operations Soon

Rumors of Abandonment Are Declared To Be Unfounded

Contrary to an impression widely circulated through the West, and given notice recently in these pages, the Granby Consolidated Mining, Smelting & Power Co. intends to resume operations at its Copper Mountain property in a few weeks. A delay has been caused by the necessity of repairing the four-mile branch railroad running from the Canadian Pacific R.R. station at Princeton, B. C., to the Allenby concentrator. The railroad spur was badly damaged by slides while the property was shut down. Colonel J. T. Crabbs, president of Granby and its subsidiary, the Allenby Copper Co. (formerly Canada Copper Corporation), who has just returned from an inspection trip, estimates that it will take about sixty days to put the railroad in condition. In the meantime advantage is being taken of the delay to install additional equipment in the mill and to prepare it for full duty when operations are resumed.

Colonel Crabbs reports that Granby is busy building its new concentrator at Anyox, which is expected to be completed by the end of this year. This new unit will add greatly to the flexibility of operations at the company's main plant. The hydro-electric installation for the mill will be ready early in September when the new storage dam is scheduled for completion. The steam plant will be used in emergency. The coal properties of the company at Cassidy are working at full capacity supplying the coke ovens; the balance of the production is sold commercially.

Utah Copper Memorial Club House to Robert C. Gemmell

The Utah Copper Co. is planning a worthy memorial to Robert C. Gemmell, formerly general manager, recently deceased, in the form of a large and commodious club house for its employees at Bingham. Ground has been broken for the foundations of the building, which is to cost about $125,000. Plastered brick will be used in the construction, and copper shingling, a recent innovation. In the basement will be locker rooms and shower baths. The first floor will contain a gymnasium, a billiard and pool room, lounge rooms and kitchen. On the second floor there will be a balcony, a ladies' rest room, library and writing room. When completed the building will be the finest of its kind in the West. It will be called the Robert C. Gemmell Memorial.

Steel Work of Magma Smelter Completed

The steel work of the new smelter that is being erected by Magma Copper Co. at Superior, Ariz., has been completed and a large force of workmen are rushing the remainder of the construction. About six hundred men are now employed by the company and the mill is operating at capacity. Shipments of concentrate and direct smelting ore are being made regularly to the American Smelting & Refining Co. smelter, at Hayden. This material is now handled over the new standard-gage railroad that was constructed recently to replace the old narrow-gage road between Superior and Magma Junction, which are situated on the Arizona Eastern Railroad.

U. V. X. Fights for Lower Rail Rate

Trying to Obtain Fair Carrying Charge to Pacific Coast From Arizona

The Interstate Commerce Commission has under consideration an important rate case, the decision of which will have a material bearing on copper production in Arizona. The United Verde Extension Mining Co. has assailed the existing freight rate on copper bullion to the Pacific Coast. This high rate on western movement has made it necessary to ship eastward, thereby giving the rail carrier a longer haul. The United Verde, however, is determined to take advantage of the low rates now available for water transportation and has asked the Interstate Commerce Commission to find any rate in excess of $4 per ton from Clarkdale, Ariz., to tidewater at San Pedro, Calif., as being unreasonable.

At the present time, the copper company points out, a rate of $30 a ton is in effect from Clarkdale to San Pedro. The Santa Fe has proposed to reduce that rate to $9.50 per ton, but even that rate is entirely out of proportion to the rate allowed on the movement of copper from other points. The $9.50 rate gives the carrier 60c. per car-mile. This compares with 25c. to 27c. voluntarily accorded copper producers in Utah, Nevada, and Montana to Pacific Coast ports.

In connection with this case, James S. Douglas, the president of the United Verde, has pointed out that within his experience the production of copper in the Arizona district had increased from 40,000,000 to over 500,000,000 lb. annually. One-third of this year's production would be moved to San Pedro

were a $4 rate available. At the present time, he pointed out, output is being restricted by the fire hazard incident to the extraction of heavy sulphide ore, but within two years that difficulty will have been overcome to such an extent that a large increase in output may be expected.

The direct charge is made that it is the policy of the Santa Fe company to obstruct the use of water in reaching the copper markets of the world. In connection with this case, figures are presented to show that Arizona's copper mines pay more than 50 per cent of the total taxes in Arizona and that they pay double the taxes paid by railroads based upon the value of these two classes of properties. The copper mines give employment to 70 per cent of the State of Arizona's working population.

Keystone Storing Concentrates

The Keystone Mining Co.'s mill at Park City, Utah, is treating about 110 tons of ore daily. During the two weeks ended June 14 the company shipped 625 tons of ore and concentrates. From now on, however, pending higher lead prices, both shipping ore and concentrates will be stored. Conditions at the property are favorable. The low-grade orebody is increasing in size with development, and high-grade ore, 8 ft. in thickness, is said to have been followed for 125 ft. The company has already in storage 250 tons of shipping ore.

Rouyn District Over-Boomed

Some lurid advertising is being indulged in by promoters who are endeavoring to sell stock in new companies formed to develop properties in the Rouyn gold district of northwestern Quebec. This section holds out considerable promise, but there is nothing to justify the statements that are being made. To date there have only been a few discoveries that appear to be of importance, although it is stated that men who are finding veins are not reporting them. Under the Quebec law very large areas can be staked, and as a great many of these claims were staked last winter, the boundary lines are not well shown, and a great deal of surveying must be done before it is possible to determine just where the lines are. Under these circumstances prospectors are chary of reporting discoveries, as they might later be found to be on other claims. On the Noranda property two shoots of commercial ore have been found on the surface, and a diamond drill has been started in an effort to link these up. So far the most important discoveries on the Noranda lie toward the southern part of the property, but as the company holds a total acreage of 2,000 acres in one block, a great deal of prospecting will have to be done before a definite statement can be made as to its possibilities. It is understood that diamond drilling done on the Hammil group, north of the Noranda, was not satisfactory and the option has been dropped.

Hecla Fire Affects Bunker Hill Lead Output

Lack of Ore Supply From Big Producer Limits Kellogg Smelter Operations to One Furnace

OPERATIONS at the Bunker Hill smelter, at Kellogg, will probably be limited to one ore furnace after Aug. 15, as a result of the recent fire at Burke which wiped out the surface buildings and part of the underground equipment of the Hecla mine.

Work of driving through the tunnel from the Hecla to the Star mine will also be held up because of the fire. This tunnel driving was to have been completed about Oct. 1.

"Our smelter received all the lead ore from the Hecla, which has been running between 4,500 and 5,500 tons per month," said Frank M. Smith, smelter director, at the company's offices in the Paulsen Building, Spokane, Wash. "This ore contains about 50 per cent lead or about 2,500 tons, which has enabled us to operate more than one furnace. As it will take some time to re-establish the Hecla, we will have to run on one furnace for some time."

The immediate effort is being concentrated on saving the mine from the water that would rise in it. To this end, the Washington Water Power Co., of Spokane, recently restored the lines that convey current for pumping, but it was estimated that a few days would elapse before the cables that carry current to the pumps could be replaced. Restoration of the cables is handicapped by the great heat held by everything about the opening of the mine. Not until it has diminished will it be possible to enter.

So far, no indication has been found that the fire entered the shaft. The shaft is cemented to a depth of 80 ft. from the collar, but is timbered and unprotected from flames below that point.

Construction of a metallurgical plant for the dressing of zinc ore from the Hecla property was projected by the Bunker Hill and timed for completion about when the raise from the Star crosscut reached the old workings of the Star, 2,000 ft. above the crosscut. This was to have been in about a year.

Definite plans for the restoration of the Hecla have been made by President McCarthy. It is declared that the spirit of co-operation that made the Hecla great will be found in the restoration. To the men who tried so desperately to save the Hecla plant it seemed ironical that the Tiger-Poorman structure near by, abandoned many years, escaped the flames.

Colorado's "Blue-sky" Law Effective Aug. 1

Requires Statement Concerning Promotions

The Colorado "blue-sky" law, known as the "Securities Act," passed by the Twenty-fourth General Assembly, becomes effective Aug. 1. The measure differs from usual legislation of this nature inasmuch as it only requires that the dealer in securities shall file with the Secretary of State a statement containing all essential facts concerning the promotion, and does not require that a commission or state agency shall pass upon or authorize the sale of securities.

The principal requirements are that the statement shall contain the names and addresses of the issuer, the nature of the business, the amount and classes of securities issued, with full information relating thereto, and the uses to which the proceeds are to be applied. If the issuer has not been in business for more than five years the amount or estimated amount of preliminary or organization expenses, and what commissions are offered or paid for sale of stock; amount of securities issued or to be issued for any consideration other than cash, and full particulars of the nature and extent of the interest of the directors and officers, and how acquired. This statement must be signed by the principal officers and directors of the issuing company.

In case of fraud or misrepresentation in any material respect in this statement, any person acquiring securities to which the statement relates shall be entitled to recover, from any one or more of the signers of the statement, all losses sustained by reason of such fraud or misrepresentation.

The usual exemptions are made, such as government securities, and bank stock, as well as securities which are listed on the New York, Chicago or Boston Exchanges or the New York Curb. A further exemption is made where the persons solicited to buy do not exceed fifty in number. Violations of the provisions of this act are punishable by a fine or imprisonment, or both.

Colorado Corporation Begins Production

The new mining project undertaken by the Colorado Corporation, which embraced the rejuvenation of the old Rawley mine, at Bonanza, is now entering the initial stages of production, and the mill product is moving to the smelter in increasing volume.

The new 300-ton mill is being brought up to maximum capacity, and the seven-mile tramway, extending from the mill to the loading station on the railroad, is undergoing modification which will simplify its operation and greatly increase its carrying capacity. The management expects to complete the changes found necessary in initial operation and have equipment up to capacity within the next thirty days.

The enterprise is financed by the Bulkeley Wells interests, the American

Smelting & Refining Co., and E. M. Davis, of New York. The development comprises approximately 18,000 ft. of workings in virgin ground, showing, it is estimated, approximately 300,000 tons of ore, containing 2,700,000 lb. of silver, 16,500,000 lb. of copper, and 20,150,000 lb. of lead.

Commerce Mining Operates Own Insurance Department

Satisfactory operation of its own insurance department is being conducted by the Commerce Mining & Royalty Co., one of the largest in the Tri-State field, according to a recent statement made by Ralph Tuthill, of Miami, who heads the company's insurance department. Mr. Tuthill says that the company's payroll last year totaled approximately $450,000. Of this amount 6 per cent is made into a reserve fund, from which compensation and liabilities are paid. But last year the amount necessary to adjust all claims against the company was a little less than 4 per cent of the payroll, indicating it is cheaper for the company to carry its own insurance than to have it carried by regular insurance companies.

In an address before the Tri-State branch of the American Zinc Institute, Mr. Tuthill suggested that requirement of physical examinations of men prior to their employment would result in decreased cost of insurance.

Canada Making Arsenic Survey

Canada is taking stock of its arsenic-producing potentialities. The mines branch of the Dominion Department of Mines is assisting in the survey. Many of the old dumps at Nova Scotia gold mines could be made to yield as high as 35 per cent arsenic, it is said. Though at present four-fifths of Canada's production of arsenic comes from the smelting of the silver-cobalt-nickel ores of the Cobalt district, there are other promising sources of production. A very considerable yield of arsenic is coming from the British Columbian ores being shipped to the Tacoma smelter. Canada's 1922 output of arsenic was 2,576 tons, or an increase of practically 75 per cent over the 1921 production.

Community Building Project Beautifies Inspiration

Attractive Homes for Employees, School and Store Part of Elaborate Construction Program

BY LOUIS WARE

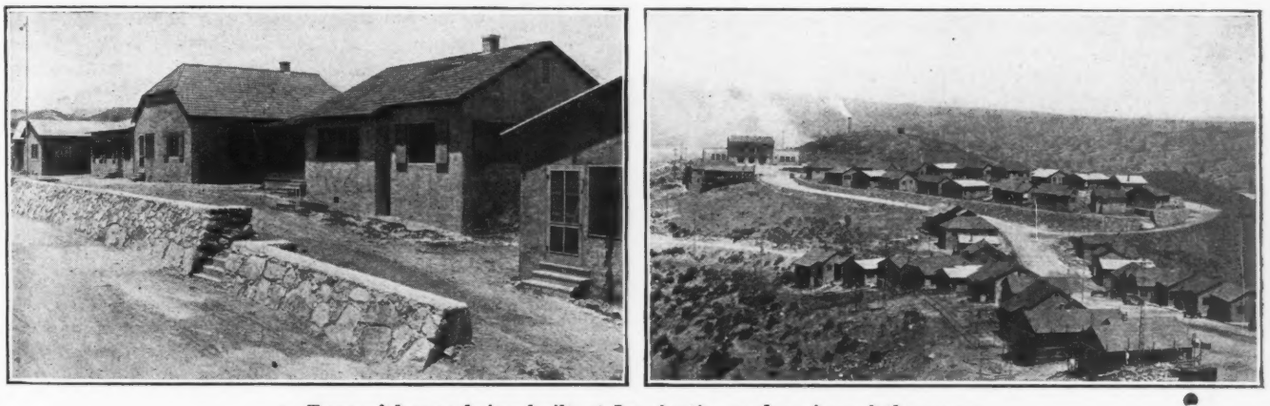
THE Inspiration Consolidated Copper Co. has a large program of construction under way that will more firmly entrench its position as the greatest copper producer of the Southwest. The sinking and equipping of the Porphyry Shaft, a 16 x 24 ft. opening, over 1,400 ft. deep, the largest shaft in the West, together with the erection of the headframe and a new hoist that will handle the large tonnage that Inspiration must get out; the installation of added electric equipment at the power house and a new compressor; the construction of a railroad from the crushing plant to the new shaft, and a large program of underground development in connection with the opening of the new shaft are some of the big jobs that are included in the plans now being developed. But aside from these mining and mechanical projects, the company has a new townsite nearing completion which will provide comfortable and modern homes for its employees.

The Inspiration mine is located about five miles from the town of Miami and six miles from Globe and the losses to the men, as well as the company, in having most of the employees live at so great a distance from the mine are readily appreciable. Previous to the present construction there were homes for some of the staff officials and a few workmen at the mine, but the present contingent of homes is a definite step toward establishing a large and permanent townsite. One contract for forty residences is completed and the homes are occupied; another group of thirty-eight are in process of erection; a school building and a modern store that will serve the community are included in the project. Appropriation has also been made for the construction of a swimming pool and it is expected that some kind of a clubhouse or community building will be provided for in later contracts.

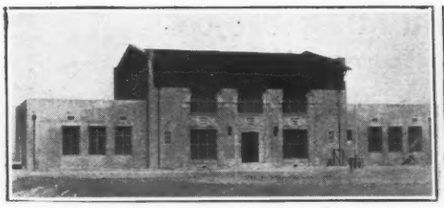
There is a striking difference in the type of buildings that are to be found at the Inspiration property and those that are generally met with in western mining camps, and it is evident that the management have put much thought into planning locations and design of the structures. The homes for employees are all of different design, both interior and exterior, an item that adds much to the cost of such a project, yet shows that the builders are appreciative of the result and consider it worth while to avoid that unattractiveness which is often effected in industrial housing schemes by constructing all the houses alike.

The homes being built contain three, four or five rooms and all have in addition a large bath room, closets, screen porches and many built-in conveniences. The walls consist of cement plaster, applied by means of a cement gun on a heavy chicken wire that is nailed against a backing of building paper, to two by four studs. The rooms are all plastered, the floors are either maple or oak and the roofs are either cedar, redwood, zinc or copper shingles. Each building is equipped with modern plumbing and the wiring is complete, many outlets being provided for the use of electric appliances. All screens are copper, and flashing and gutters are of the same material. Groups of garages have been erected contiguous to each section of the townsite and a sewage system has been installed together with other provisions for complete sanitation. Three room houses cost about $2,500, four room houses cost $3,000 and five room houses cost $3,300.

The site on which the town is being constructed is located about midway between the mine and mill, a portion of which is on the old Warrior ground, owned by Inspiration, and the remainder is an area the surface rights of which were secured from the Miami Copper

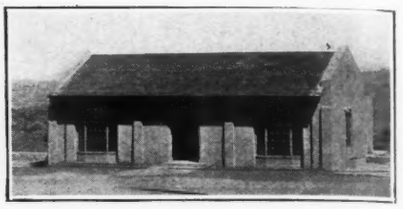


Type of homes being built at Inspiration and a view of the camp



Benjamin Franklin school

Inspiration company offices



Company store at Inspiration

Co. The ruggedness of the location made difficult and expensive the construction of building sites and in many cases the excavation, which is in solid rock, has cost more than the house that was erected on the finished plot. The architect, in planning the project, made a clay model of the entire area, placing models of the houses on it and carefully selecting a final design that was most adaptable to the topography.

The erection of the Benjaman Franklin school, which is a part of the town, was supervised by the company and paid for by the school district, in which Inspiration pays over 95 per cent of the school taxes. This building, together with equipment and apartment houses for teachers, cost $130,000. The school is complete and modern in every detail and playgrounds and other appurtenances are provided. The teachers' homes contain quarters for twelve teachers; they are completely furnished and the company supplies heat and electricity without charge.

One of the greatest assets to the community and one that will effect a great saving to the employees is the company store. A modern store building has been erected at a cost of $40,000 and it will be operated on some scheme whereby basic goods are supplied to employees without profit to the company. It is likely that the method of operation adopted will be similar to that of the stores operated by Miami Copper Co. and New Cornelia; that is, the prices for goods are kept on a basis that would seem to allow a fair margin of profit to a competitive merchant and the profits earned at the end of regular periods disbursed to the employees on a basis of the total amount of purchases. This scheme automatically confines the buyers to the employees and at the same time does not establish prices unfair to the independent merchants of the near-by towns.

Five room houses are to be rented for $24 per month; a garage is supplied with each house; water is furnished free and electricity is charged for at the rate of five cents per kilowatt hour. In connection with the design of the townsite, adequate appropriation has been made for landscape construction that will make the homes more beautiful. The building of comfortable, modern and convenient homes for employees like the ones being erected by Inspiration will do much toward making life in a mining camp more livable and provisions that will free the men from rent and food profiteers are sure to result in satisfaction among the employees.

Manager's residence

Miami Distributes Store Earnings

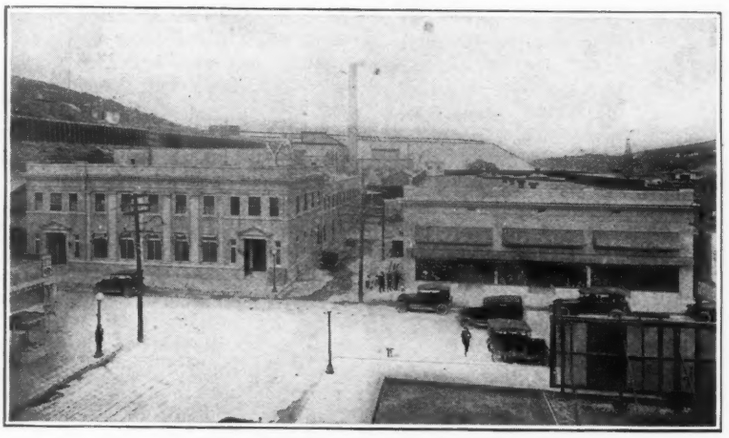
The Miami Commercial Co., which operates a department store at Miami, Arizona, for the benefit of the employees of the Miami Copper Co., after announcing that earnings for the first half of the year totaled $48,455.74, distributed them July 19. This amounts to returning to each employee 17.1038 per cent of the total money that he has spent at the store during that period. This exceeds the profits of the previous six months by 2.4 per cent and is the largest "dividend" to have been disbursed by the company since the store was started. This is an example of one company store that is a great source of satisfaction to the employees; one that is operated efficiently and where the savings that are effected by buying in large quantities are given back to the patrons at the end of each six months' period. New Cornelia Copper Co. also operates a store at Ajo, Arizona, for its employees and the Inspiration Consolidated Copper Co. has just completed the erection of a store as a part of the new townsite that is being constructed at the Inspiration mine. There has been some opposition expressed against the operation of company stores in Arizona and a measure was introduced at the last legislature to prohibit mining companies from conducting merchandising projects, but was defeated, after employees' committees had been heard.

Ohio Copper Has Low Production Cost for June

The Ohio Copper Co., at Bingham, Utah, is showing increasingly good results from its leaching-in-place operations. During June on small-scale operation the cost of production was reduced to 6.444c. per lb. of copper. When the 1,500-gal. pumping equipment has been installed, the management expects to reduce the cost of production still further. During the first six months of 1923, there were produced 1,229,436 lb. of copper at an average cost of 7.284c. per lb. During June production amounted to 332,786 lb., and the recovery was 95.4 per cent. Precipitates average 92.5 per cent copper. It is expected that all of the new equipment will be installed by the middle of September and the flow of 1,500 gal. per minute distributed. The present flow is about 575 gal. per minute. Concrete stations are being installed for the pumps and necessary equipment is on the ground so that the pumps may be installed as soon as they arrive at the property.

Ontario Mines to Conciliate Differences with Labor

The Ontario Dominion Minister of Labor has appointed a Board of Conciliation to deal with the differences between the Hollinger Consolidated, McIntyre, Schumacher and Dome mining companies, of Porcupine, and the miners in their employ. E. McG. Quirk, of Montreal, is chairman; Thomas E. Ryan, of South Porcupine, represents the miners; and Balmer Neilly, Secretary of the Ontario Mining Association, Toronto, is the representative of the employers.



Miami Copper Co.'s department store

Gogebic Iron-Ore Shipments Below Estimates

The season's shipments of ore from the Gogebic Range will not exceed 4,500,000 tons, instead of reaching 6,000,000 tons, as had been generally predicted when the season started. Several of the large mines have stopped shipping from their stockpiles and are shipping only their daily hoist. The Newport, the largest mine in the district, has taken only one cut from its stockpile, which gives room to erect a new trestle for stocking ore next winter. The Ironton mine also has shipped but a small part of its stockpiles. The railroads are furnishing plenty of cars and there is no great shortage of labor; the only trouble seems to be slackening of demand from the steel manufacturers.

In a overwinding accident at "E" Shaft of the Aurora mine the skip was wrecked and serious damage done to the headframe and idler stand next to it. The skip fell back to the collar of the shaft, but just missed going down the shaft. The only casualties were to some passers-by, who were struck by falling plank, and they were not serious. The hoist at this shaft is a second-motion electric-driven one with two separate safety devices to prevent overwinding and overspeed.

Porcupine Now Has Surplus Water Power

With the turning on of the second unit of the Lower Sturgeon power the gold camp of Porcupine, Ontario, now has a surplus for the first time in a good many months. It is understood that about 3,500 h.p. is not being called for, but as the Hollinger gradually increases its production it is expected that this surplus will be taken up. During the last month there has been a good deal of rain, and the storage basins are reported to be filled, so that no further shortage for the current year is expected.

The Great Northern Power Co. is also delivering energy to Porcupine, and the Davidson Mines is the first to start using it. The Nighthawk Peninsular is expected to start using Great Northern power within a comparatively short time and a line is also being built to the Coniagas operations on the Newray property.

Northwest Magnesite Installs Electric Shovel

The Northwest Magnestie Co. at Chewelah, Wash., has recently installed a large electric shovel at the Finch quarry, according to reports at hand. When the company puts on a full crew in the fall, the shovel will be operated at full capacity. For the present operations are curtailed until the surplus stocks of Austrian magnesite are consumed, and it is estimated that the local plant will be in full operation in about three months.

News from Washington

By PAUL WOOTON
Special Correspondent

Senator Pittman Appeals to Comptroller General

Petitions for a Reconsideration of Silver Allocation Decision in the Light of New Facts Developed by Inquiry

RATHER than indulge in further efforts to secure an acknowledgment from the Under Secretary of the Treasury that purchases of silver under the Pittman Act have not been completed, Senator Pittman, on behalf of the Senate Commission of Gold and Silver Inquiry, has carried the matter over the head of that official and has asked the Comptroller General of the United States to reconsider his former decision, in the light of the facts which he did not have at the time the opinion was rendered. The full text of Senator Pittman's letter to the Comptroller General follows:

On behalf of the Senate Commission of Gold and Silver Inquiry, charged, among other duties, with the investigation of the administration of the act of Congress approved April 23, 1918, sometimes known as the Pittman Act, I respectfully petition that you reconsider your decision of Nov. 29, 1922, relative to the allocation of certain standard silver dollars and other silver for subsidiary coinage, under said act of April 23, 1918, and that upon such consideration you examine and base your further decision in the matter upon the evidence taken by the subcommittee of said commission and the correspondence and arguments had and made upon the part of the commission and upon the part of the Treasury Department. All of such evidence and correspondence and arguments are herewith submitted to you in support of and as a part of this petition. In further support of this petition, I have the honor to make the following statement:

1. Your said decision of Nov. 29, 1922, was made at the request of the Treasury Department, and was based upon a statement of facts submitted to you as a part of such request by said department in its letter of request dated Nov. 2, 1922.

2. Material facts stated in said letter of request by the Treasury Department, upon which your decision was based, were untrue and have been disproven by the evidence taken in the matter.

3. None of the said silver so allocated was, at the time the said request was made for your decision and at the time the decision was rendered, in the subsidiary silver account of the mint subject to control of the Treasury Department.

4. All of such silver had been melted up, coined into subsidiary coins, and distributed.

5. In each of the orders of the Treasury Department making such allocations, the Treasury Department directed that an equal number of ounces of silver be purchased under the act of April 23, 1918, with which to cover said silver so allocated and with which to recoin an equal number of standard silver dollars to be placed in the Treasury of the United States in lieu of those allocated and melted up. Such orders were carried out at the various mints and such quantity of silver was purchased under said act for such purpose prior to the date upon which you were requested to pass upon the authority to revoke such allocations and prior to the date of your decision.

6. Said allocations had been consummated prior to said attempted revocation and prior to your decision, and such allocations were *functus officio*.

7. The Treasury Department has ordered and is attempting to melt up and coin recoinage subsidiary silver into standard silver dollars for the replacement of such standard silver dollars in the Treasury that were melted up under the allocations referred to for subsidiary coinage, in disobedience to the express mandate of section 9 of the act of March 14, 1900, page 1122, Revised Statutes, which directs the Secretary of the Treasury to recoin subsidiary coins. I refer you to letters of the Director of the Mint, dated December 19, 1922, addressed to the various mints and the New York Assay Office, which letters will be found at pages 145, 146, and 147, serial 1, part 2, of the hearings before the subcommittee of the Senate Commission of Gold and Silver Inquiry.

8. The Treasury Department has ordered and is now attempting to take from the subsidiary coinage accounts of the mints other silver acquired from domestic and foreign sources otherwise than under the act of April 23, 1918, and to melt up such silver, coin it into standard silver dollars, and with such standard silver dollars to replace the said standard silver dollars so allocated for subsidiary coinage.

9. The Treasury Department has ordered and is now attempting, without authority of law, to use the silver in the subsidiary coinage accounts of the mints and the New York Assay Office for the coinage of standard silver dollars.

10. On July 9, 1923, I wrote a letter to the Treasury Department requesting that it petition you for a rehearing of this matter. In that letter I cited the evidence in support of such request, referring to the pages of the transcript where it was found. I herewith submit to you a copy of such letter, as printed in the hearings, which letter not only quotes verbatim from the evidence in support of such request, but now refers to the pages where such evidence is found in the printed hearing had by the commission.

11. On July 13, 1923, I received a letter from the Treasury Department refusing to grant my request that it petition you for a rehearing in the matter. I herewith attach said letter for your information and as a part of this petition.

12. On July 14, 1923, I replied to the last above-mentioned letter, in which I again called attention to the discrepan-

cies in the statements of the Treasury Department, traversed its arguments, and notified it that I would submit this matter directly to you.

13. On April 23, 1923, I first petitioned the Treasury Department to reconsider its order of revocation and to continue the purchase of silver to cover such allocations, as required by the act of April 23, 1918. While that letter was written prior to the discovery of the fact that all of said silver had actually disappeared into subsidiary coinage, it contains a brief and argument on the act of April 23, 1918, relating to allocations, and sets forth facts as shown by the records of the Treasury Department, which were urged in support of such petition. Although the grounds for the reversal of such decision are now much stronger by reason of the discovery of the fact that such silver so allocated actually disappeared into subsidiary coinage and was not subject to the control of the Treasury Department at the time said orders of revocation were made, I, nevertheless, attach said letter hereto as a part of this petition, and respectfully request that it have your consideration.

14. On May 9, 1923, the Treasury Department replied to the foregoing letter and petition, and in such letter traversed my argument and declined to reconsider its order of revocation. I attach such letter as a part of this petition.

15. On May 14, 1923, I replied to the last mentioned letter of the Treasury Department, a copy of which reply is hereto attached, which I also make a part of this petition and respectfully urge you to consider.

16. Exhaustive examinations were made by special auditors of the commission of the books and accounts of the mint and the Treasury Department bearing upon these questions. The testimony of Miss M. M. O'Reilly, Acting Director of the Mint at the time said allocations were made; of Mr. Frantz, the auditor for the mint; and others was taken before the commission. All of these reports and all of the evidence are herewith submitted to you as a part of this petition and in support thereof, and you are respectfully urged to give them your consideration.

I anticipate that there will be no necessity for the taking of further evidence or the hearing of further argument by your department, as the Treasury Department in its letter which is hereto attached contends that such evidence is insufficient to warrant a rehearing, and, as far as the commission is concerned, it is willing to submit the matter to you upon the record submitted. The arguments on behalf of the commission and on behalf of the Treasury Department are complete and exhaustive, and it would therefore appear that no further arguments will be necessary.

I am compelled to leave for the West to participate in other hearings of the commission relative to other subjects, and I am therefore compelled to leave the matter in your hands on the record as it stands.

Respectfully submitted.

(Signed) KEY PITTMAN

News by Mining Districts

By Special Correspondents in the Field

London Letter

Katanga to Proceed With Leaching—Knight Central to Abandon Operations—Selection Trust May Become Public Flotation

BY W. A. DOMAN

London, July 12—A few weeks ago I mentioned that Hugh F. Marriott had been called in to reorganize the finances of the Magadi Soda Co., which works—or rather owns—a large soda deposit in East Africa. He has now announced that he has ceased to be actively concerned in the company. This announcement has come as a great surprise to many shareholders and debenture holders who had placed great faith in his name and ability, and who were looking forward to the time when dividends would be paid. No explanation is given, so that the matter remains more or less of a mystery. Reading between the lines it would appear that the representative of other big interests has come forward with another proposition. Mr. Marriott, who leaves today for Australia to attend the Pan-Pacific Conference as a representative of the British Government, would have returned via East Africa. He has now changed his plans, and expects to travel via Vancouver and look round Canada to see whether there is anything worth his consideration in the mining fields.

Robert Williams, the African pioneer, has just returned from an inspection tour in Katanga, and represented the English shareholders at the annual meeting of the Union Minière du Haut Katanga, held in Brussels on Monday. The company hopes soon to proceed with plans for the leaching scheme. The ore reserves total 68,000,000 tons, containing 4,500,000 tons of copper. Tin and cobalt treatment is proceeding, as well as the extraction of radium from uranium ore at the Oolen works, in Belgium, which have been successfully established.

Not for many years has the Knight Central Gold Mining Co. (Witwatersrand) worked at anything like a profit, and on one or two occasions the question of shutting down has come under consideration. At the request of shareholders and others, further attempts were made to test the property. It is, however, situated in a part of the Rand which is full of dikes, and where the gold deposition is poor. The company is already in liquidation, and it is now officially announced that as the continuation of mining operations can no longer yield a profit, breaking of rock was discontinued on July 6, and it was expected that milling operations would finally cease yesterday. Unfortunately this is not the only Rand mine that will soon be found to be *in extremis*.

Investors in San Francisco Mines of Mexico had something of a shock on the publication of the June return. That it might be below the May figure was indicated by the persistent fall in the price, but that the profit would tumble from $98,595 (United States dollars) to $57,705 was not expected. The position is attributed to experimental work. The new plant is getting into operation, and although it is not so stated officially I understand that the management endeavored to get a higher extraction out of this new plant. By concentrating on this object, a smaller tonnage was treated, and as the standing charges were not reduced, the result was poor. The total issued capital of the company is now about £750,000 and the actual profit for the nine months of the company's year is approximately £123,-200. At this average there should be £164,000 for the full twelve months, which would allow of a substantial dividend being paid, though talk is not now in the optimistic vein in which it was formerly.

It is rumored that A. Chester Beatty, of the Selection Trust, the principal interests of which are in Burma Corporation, Bwana M'Kubwa, and Rhodesia Border Concessions—intends floating the Selection Trust as a public company. The existing capital is £50,000 and it is suggested that it is to be increased, and that the public is to be invited to subscribe for some of the shares.

Chester Beatty is largely interested in diamonds in the Akim district of West Africa, and it is believed that he will put his interest in this property into the Selection Trust.

Brisbane Letter

Australian Labor Legislation Held to Retard Investment of Capital—Mining of Cobalt Limited

Brisbane, June 18.—R. W. Stringer, a Melbourne capitalist who is largely concerned in mining enterprises, particularly tin, has lately been in Brisbane on business. He is in several of the big companies concerned in tin mining, not only in New South Wales and Tasmania but in the Malay Peninsula. A good deal of stock in the Straits companies is held in Queensland, and while here Mr. Stringer arranged to have these companies listed on the Brisbane Stock Exchange. He says that Victorian capitalists do not look with favor on Queensland mining investments, for the reason that they do not consider Queensland legislation, while it looks after the interests of the working miner, or is considered to do so, liberal enough to the mining investor. In his opinion there is no sense of coddling the workman if you choke off the capitalist who finds his pay. However, the present labor (or socialist) government, which, by the way, has just been returned to power with a good majority, has promised to make amendments in

the law controlling oil leases and prospecting in the direction of making it more liberal; and Mr. Stringer, whose chief object in coming to Brisbane was to look after the oil proposition at Beaudesert, in which he is the leading spirit, it quite satisfied with the nature of the proposed legislative alterations. The law which the government now acknowledges to be defective was passed by this same government in 1920.

L. E. Nicholson, another recent visitor to the metropolis, is the manager of the Mount Elliott Copper Mining Co., which owns mines and smelters in the Cloncurry district, and which is soon expected to resume operations after its long period of idleness. Mr. Nicholson, as there was "nothing doing" by his company at the time, contested the Cloncurry electorate in the late state general elections against the labor candidate, and was badly beaten. He was one of the original promoters of, and is still interested in, the company working the Cobalt mine in the Cloncurry region. He says the outcrop of this mine was discovered by a kangaroo shooter and prospector named Eaves, who had acted on the advice of W. H. Corbould, then general manager of the Mount Elliott, to look out for cobalt bloom, and who recognized the metal on the surface from what was described as its beautiful peach or purple color—"something like a mass of colored fibre or wool." The outcrop was found near the Mount Elliott mine, and the syndicate that took up the lease consisted of Corbould, Major General Hughes, and L. E. Nicholson, all concerned in the Mount Elliott company, together with the discoverer, Eaves. According to Mr. Nicholson, the cobalt ore occurs in lode formation, varies from 2 ft. to 14 ft. in width, and goes from 5 to 20 per cent.

Mr. Nicholson says the Cloncurry cobalt mine, after being held back from scarcity of water, is for the present out of that trouble and is looking well. The lode is going down and gives every indication of permanence. The concentrates are shipped direct to Birmingham, in England. So far, he says, the demand for cobalt is limited, and is not expected to improve until things get more settled in Europe.

W. H. Corbould, since he left the Mount Elliott company and for many years before, has resided mainly in London.

Johannesburg Letter

Flotation Plant Being Built at Modder Deep—"All Sliming" to be Used at West Springs

BY JOHN WATSON

Johannesburg, June 19—A charge is sometimes made against the metallurgists of the Rand that they adhere too much to the old methods. At present, on the Far East Rand, a plant is being erected which should go far to remove such accusations. At the Modder Deep, the oil flotation process is being installed and is expected to be at work before the end of this year. It is hoped, there, to recover the cost of installation out of increased revenue within two years of work. The use of this process, in connection with the sand plant will be watched with much interest, as this is the first trial of oil flotation on a working scale on a Rand gold mine.

At the annual meeting of West Springs, Ltd., held in this town on June 8, Sir Ernest Oppenheimer, the chairman, referred to their new plant, which is to be on the "all-sliming" system. So successful has this method been at the Springs Mine, the group is adopting it at this newer mine. The capacity at first will be 40,000 tons per month; but the plant is being laid out so that its size can easily be increased by 50 per cent, at any time. A higher percentage of extraction is obtained by the all-slime method at Springs. Tube-milling preceded by single-stage crushing without battery stamps will be used. The first cost of such a plant is considerably less. The gold will be recovered by cyanide solution, alone—no amalgamation—and the precipitation of the gold will be effected in Merrill presses, working in conjunction with the Crown vacuum process. The new plant is of a very compact type, enabling close and continuous supervision to be maintained more effectively than by the old system.

The chairman (F. R. Lynch) at the annual meeting of Springs Mines, Ltd., held on June 8, referred to the extension of their reduction plant from 40,000 to 50,000 tons per month, completed about the middle of last year. At that time, their amalgamation plant was eliminated. By the all-slime method for March, 1923, the reduction costs showed a saving of 6.25d. per ton of ore treated and the increased extraction, due to finer crushing, equalled 10.92d. per ton, giving a total in favor of the new method of 1s. 5.17d. per ton treated. Additional plant is now on order to increase the capacity to 60,000 tons a month.

The following dividends have recently been declared for the current half-year:

	Dividend No.	%	Rate of Dividend Per Share
Geduld Proprietary	17	11¼	2*s*3*d*
Modder Deep	17	60	3/
Robinson Deep "A" shares	7	—	4/
Sub-Nigel	21	3¾	9*d*
Rand Mines, Ltd.	40	60	3*s*/ per 5*s*/ share
City Deep, Ltd.	22	20	4/ per £1
Crown Mines, Ltd.	44	27½	2/9 per 10/ share
Modder B.	22	50	2/6 per 5/ share
New Modder	34	50	5/ per 10/ share
Nourse Mines, Ltd.	36	3¾	9*d* per £1 share
Rose Deep, Ltd.	44	6¼	1*s*3*d* per £1 share
Village Deep, Ltd.	27	5	1/ per £1 share
Meyer and Charlton	67	50	10/ per £1 share
Van Ryn G. M. Estate	39	7½	1/6 per £1 share
Aurora West	1	5	6*d* per 10/ share

MONTANA

Consolidated Placer Builds Flumes

More than one mile of flumes, representing an outlay of $4,000, has been constructed by the Consolidated Placer Mining Co., now operating near old Diamond City, Mont. The work has been done under the direction of Fred McCoy, superintendent.

MEXICO

Dolores Producing Silver

There is noted activity at the Dolores mines, pertaining to the Real del Monte y Pachuca Co., situated about five kilometers from the city of Pachuca. The operating company is organized under the laws of Mexico but is controlled by American stockholders.

The Dolores group of mines is formed by the Santa Brigida, of 48 claims; the San Luis, 7 claims; Santa Margarita, 38 claims; La Reina, 8 claims; La Vizcaina, 16 claims. They are among the oldest of the famous Real del Monte mining camp and noted for their enormous production of silver. The general run of ore assays from one to three kilograms of silver per ton, but pockets and streaks of fabulously rich ore are often encountered. During the early part of the present century large quantities of the better grade of ore were shipped to Germany for treatment.

Cinco de Mayo Will Explore

Hermann Rosenow, representing the Cinco de Mayo Mining Co., will leave shortly for London and Paris to confer with stockholders. This company proposes to spend $75,000 on exploration work during the next 18 months and in the event sufficient ore is blocked out to warrant it, the company is to be reorganized with a greatly increased capitalization.

The present stockholders will receive a certain portion of stock while the balance will be placed on the market, and the proceeds therefrom will be employed in general improvements about the mines and mills.

John Dwelly Becomes Manager

It is reported from Oaxaca that John Dwelly, formerly in charge of the San Cayetano de Bordo mine, has been named general manager of La Blanca y Anexas Mining Co. A number of improvements are to be made about the Blanca mines.

El Fenix y Anexas Mining Co., composed largely of French capital, held a general meeting of shareholders on the fourth of this month for the purpose of authorizing the board of directors to sign contracts with the French company, Société Française d'Etudes du Mexique.

Aurora y Anexas Soon to Run Mill

The Aurora y Anexas Mining Co., operating the Aurora mines at Xichu, in Guanajuato, has received a new Deutz-Otto engine from Germany which is being installed at the flotation plant. About 125 tons of copper-silver ore will be treated daily. It is expected that the engine and other modern equipment will be installed by the end of the present month.

The principal properties operated by this company are the San Enrique, San Benito, Santa Ana, Gran Bolsa and Macho Rucio. In all of these, large bodies of good ore have been blocked out for extraction as soon as the new plant is in readiness.

MEXICO—Continued

Peñoles Adds to Property

Edward A. Manderfield, representing the Cia. Minera de Peñoles, has located some new properties in the Santa Eulalia camp near Chihuahua. A group of four claims to be titled as the Alice has been recorded. They are near other properties pertaining to the company, which is shipping to its smelting plant at Torreon. The ores are principally of silver and lead.

Howard Anderson is taking up fifteen claims in the same camp. The group is to be titled as the Panuco and adjoins the Oriental and El Continente mines, which produce silver ore of good value. Engineer Julio Posada is to make the official survey and furnish plans.

Union Catorceña Discusses Plans

The Cia. Minera Union Catorceña was in session in San Luis Potosi on the ninth of the month discussing and approving plans for resuming operations on a larger scale at the San Agustin y Anexas mines, situated at Catorce. The meeting was presided over by Amadeo Ortiz, president, with Rafael G. Lopez acting as secretary.

The San Agustin mine has numerous old workings and considerable ore is still in sight, but additional development work will be necessary before actual mining for economical extraction of ore can be carried on. It is probable that new machinery will soon be installed.

Prospectors Rushing to Buenos Aires

The mines of Buenos Aires, in the district of Jala, south of Tepic, are in bonanza and many mining men and prospectors are rushing into the field. The ores are of gold and silver and occur in well-defined veins of varying widths. The mining region around Jala is very mountainous and rugged and it is generally believed that they have not been thoroughly prospected and that numerous others big producing mines are yet to be discovered.

The existence of large sulphur deposits have been proven to exist in the Volcano Ceboruco of this district, but so far have not been worked to any great extent. It is believed that with sufficient capital the mining of sulphur would soon become an important industry for the state.

ONTARIO

Sir William Arrol, Ltd., Wins Power-house Contract

Noah A. Timmins, president of the Hollinger Consolidated Gold Mines, announces that the contract for the dam and power house for the company's power development at Island Portage, on the Abitibi River, has been awarded to Sir William Arrol, Ltd., of St. Catharines, Ont., and London, England. The plans of the company call for the installation of equipment with a capacity for the production of 25,000 hp. It is expected that power will be available by the fall of 1924.

Davidson to Erect New Mill

At the annual meeting of the Davidson company held in Toronto a short time ago it was reported that the directors had decided to proceed immediately with the sinking of a 1,000-ft. three-compartment incline shaft. The directors also stated that the construction of a 500-ton mill would be started as soon as possible. The company has approximately $550,000 cash available.

Vipond Showings Promising

Satisfactory development continues at the Vipond, and the company has given a contract for the alteration to the mill, which will increase its capacity to 150 tons a day. It is expected that milling operations will begin about the first of December.

Cobalt Reports Varied Activities

In Cobalt the Coniagas has started milling ore at the Beaver. The mill has been put in condition to treat 150 tons a day, and during this construction work underground operations were continued, so that a great deal of broken ore is ready for treatment. The lower level of the Beaver is being dewatered through the Temiskaming shaft, and as soon as the water is below the 1,200-ft. level, crosscutting operations will be started at 1,200 ft. to prove the possibilities of the lower contact. The La Rose has opened up a new level at 685 ft. at the Violet property. This property is now a regular producer, and the company is understood to be making a fair profit. At the Menago property, adjoining the Violet, and the O'Brien a new vein has been found on the 935-ft. level which carries fair milling values.

McKinley-Darragh-Savage to Work New Silver Strike

Native silver in a quartz vein has been discovered close to Pine Lake in Lorrain Township, which lies between Coleman and South Lorrain. The deposit is upwards of one foot in width, with heavy leaf silver occurring in the quartz. The McKinley-Darragh, of Cobalt, has secured an option on the claim and will at once begin its development.

ARIZONA

Ivanhoe Adds to Holdings

The Ivanhoe Copper Co., whose property is situated near Warren, Ariz., recently purchased four additional claims from Martinelli and Williams, which adjoin the Don Miguel property. Assessment work has been completed by the new owners and preparations are being made for securing patent. Drifting on the 200 level is to be discontinued, and the shaft is being sunk deeper as a result of a satisfactory showing had from the 500 ft. of drifting that has been done.

The East Warren Co., one of the recent properties to have started development in the Bisbee-Warren district, has reached a depth of 90 ft. with the shaft that is being sunk. Drifting is to be started both ways from the shaft on the 100 level.

U. V. X. Must Pay Trial Costs

The Arizona Supreme Court has ordered that the Superior Court collect damages and court costs in full from the United Verde Extension Mining Co. as was assessed against it as a consequence of a smoke suit tried some time ago. The plaintiffs, Biles and Wells, had been awarded $1 for the injurious effect of the company's smelter smoke, but the defendant company was directed to pay $435.15 plaintiff's costs and $1,620 jury costs in addition. The mining company objected to the assessment of the heavy court costs resulting from the trial that lasted over a month, and an appeal was made to the higher court on that phase of the case.

Make Old Dominion Lease Pay

B. F. Van Wagenen and Jack Harrington are shipping one carload of silica ore per week from the old Buckeye mine, which they have leased from the Old Dominion Co. This mine, which is just south of the Iron Cap Copper Co.'s property, at Copper Hill, Ariz., has been operated by leasors for many years. The ore, which contains about 4 per cent copper, is highly siliceous, and an advantageous contract is in effect with the International Smelter, which needs that material for fluxing.

Sheldon Mine to Build Mill

The Sheldon mine, which is at Walker, Ariz., has announced plans for financing the construction of a mill, underground development and construction of surface buildings and other equipment that is needed. Development work is now producing about 1,000 tons of ore per month, netting $18,000, according to figures given out by the company, but it is estimated that greater profits can be realized by the construction of a 200-ton mill and the installation of other facilities for handling the ore. The directors have authorized the sale of sufficient treasury stock.

CALIFORNIA

San Francisco Correspondence.

During May the United Comstock Mines Co. mined and milled 51,400 tons and in June 54,000 tons of ore. The mill and mine are now up to a capacity of 2,000 tons per day. It is hoped that this will be increased to 2,500 tons per day during the summer, but efforts toward that end are being hampered by labor shortage. Mining and mine development costs during May were $1.32 per ton; milling $1.27; general $0.22; total $2.82. Operating costs are being steadily reduced as the mine tonnage is being stepped up and are as anticipated for the tonnage now being handled. The mill recoveries are about as expected for the upper ore zone now being mined.

U. S. Smelting Wants Lower Assessment

At Redding the U. S. Smelting, Refining & Mining Co. recently petitioned the

supervisors of Shasta County for a reduction of their property assessment from $728,360 to $422,861. Many of the larger mining companies in the Shasta Copper district have been assessed out of proportion to their value and have been put to the necessity of fighting these assessments. Location notices on eleven copper claims north of the Pit River and downstream from Bend about three miles in Shasta County have been filed by the Dominion Mining Organization, Inc., represented by Guy M. Vail.

IDAHO

Venezuela Will Build 50-Ton Concentrator

A 50-ton concentrator will be erected on the Venezuela property near Lakeview. The work will start on Aug. 15th and be pushed to early operation. The Venezuela mine was recently leased by the Hewer Mining Co. with Dan Drumheller, of Spokane, manager. Mr. Drumheller reports that the company have about completed a program of exploration comprising two raises and a drift blocking out 20,000 tons of ore. The main drift will be continued in which a depth of 1,500 ft. on the vein can ultimately be attained. The ore averages 14.5 oz. silver, 60c. gold, and 2 per cent lead.

Snow Storm Shipping Silver

The Snowstorm Silver-Lead Co., on the Idaho-Montana boundary line near Troy, Mont., is delivering 250 tons of ore daily to the mill and shipping steadily high-grade silver-lead concentrates. The mill is being operated on a two-shift basis. Good progress is being made on the No. 7 level, which penetrates the mountain for nearly a mile. At the ½-mile point a winze is being sunk 750 ft. on the main oreshoot. The equipment of the Montana Morning mine was recently purchased by the Snowstorm.

JOPLIN-MIAMI DISTRICT

Dorothy Bill Completes New Shaft

The Dorothy Bill Mining Co. has completed a new field shaft on the southeast part of its lease at Picher, Okla., and is operating it at a depth of 284 ft. Recently the company opened up a richly mineralized cave or water-course formation on its No. 1 tract that has increased production materially. The company's two mines have been big producers, and turned out more than 7,500 tons of concentrates in the first six months of 1923.

Indiana to Prospect Before Building Mill

The Indiana Mining Co. will not rebuild its concentrator, recently destroyed by fire on the company's lease southwest of Hockerville, Okla., until the tract has been thoroughly drilled out, according to announcement of R. B. Jensen, president. The burned mill was comparatively small and the reason for the planned drilling campaign is to determine if a larger mill is not justified. Successful development of rich orebodies by the Vinegar Hill Zinc Co. in its Texas mine, immediately east of the Indiana, has encouraged Mr. Jensen to believe his own lease is equally rich.

Black Eagle Ready for Duty

After extensive improvements, involving a considerable expenditure, the Black Eagle Mining Co. has the old U. S. M. & S. Co.'s mine, northwest of Treece, which it some months ago took over, ready for operation. A belt conveyor for tailing has been installed; also two new gas engines, one a Bessemer and one a Chicago-Pneumatic; and two new compressors. Considerable underground development also has been under way. M. F. Owens is manager.

MINNESOTA

Huntington Mine Shuts Down

Inability to close contracts for this season's ore has caused the shutdown of the Huntington mine, operated by the George H. Crosby interests at Ironton. The property has been stockpiling ore since last winter and has nearly 50,000 tons in stock. Opened in 1918, the Huntington closed down in 1920 for a three-year period. It was reopened last summer, when a shipment of 40,700 tons of iron ore was made by all-rail route to St. Louis Valley furnaces. The mine employed about 75 men.

Savage Company Remodels Drying Plant

John A. Savage & Co. began the season's shipments from its Sagamore mine open pit at Riverton late in June, and is now forwarding ore to docks at the rate of 90 steels per day. The drying plant at the Sagamore—now the largest iron-ore drying plant in the country—has undergone several changes and improvements since last season. A double set of Hum-mer screens has been installed over the shipping bins, making possible the separation of the dried product into lump and fine grades for shipment. The undersize of the lower 20-mesh screen is drawn off by a power fan, passed through a dust collecting chamber and water-conveyed to a settling pond. The operators are considering the practicability of sintering the fines.

Some Construction Work Under Way

The only construction work under way planned in the Michigan district is designed to increase the yield of copper and cut operating costs. The regrinding mill which Mohawk is adding to its stamp mill at Gay will result in the saving of an additional pound of copper per ton of rock; the reclamation plant which Calumet & Hecla is building on the Tamarack conglomerate sands will yield between 10 and 11 lb. of copper per ton of sand reground; and improvements under consideration in the Calumet & Hecla smelter at Hubbell, including coal pulverizing, will effect notable economies. Underground, the adaptation of shovel loaders and stope scrapers also is being worked out to meet labor shortage conditions.

A cargo of flint pebbles from Denmark has been received by Calumet & Hecla for use in its regrinding mills. The shipment is the first of its kind in several years. The pebbles were obtained along the shores of Denmark.

NEVADA

Pioche Curtailing Operations

As in practically every other camp in Nevada, curtailment is the order of the day in the Pioche district, and both the Bristol Silver Mines Co. and the Combined Metals Co. have laid off men and the production has been appreciably lessened. The Bristol Silver Mines Co. plan an extensive development at depth, but the upper levels will be thrown open to leasers instead of being operated on company account, the present tramway is a source of expense and it is possible that the tunnel may be run to connect with the Day Mine working on the other side of the Mountain range which contains both properties. The Virginia Louise, short-handed after the Fourth, is now back to normal production again, sending out 200 tons daily for the last three days. Active development is also being carried forward below the 500 ft. level and also on the 2d and 3d levels. This property is now employing 60 men and is the largest single operation in the Pioche district.

The shipments for the week ending July 12 were as follows:

Virginia Louise Development Co.	150 tons
Bristol Silver Mines Co.	360 tons
Combined Metals Inc.	225 tons
Total	735 Tons

Mabel Mine Plans Further Development

Operations at the Mabel mine, 20 miles from Mina, under option to the West End Consolidated, continue without change. The ore contains silver, gold, and lead, valued in the order given, and is high grade, although the vein is narrow and badly faulted in the upper levels. The deepest workings are 350 ft. below the surface, in a winze from the 300 level, and the vein at this elevation is said to be better defined and the ore higher grade than at any other place where developed. It is planned to sink the main shaft.

Tonopah Belmont Abandons Tungsten and Telluride Operations

The Tonopah Belmont Development Co. has stopped work on the Tungsten and Telluride property, in the Douglas district, about 15 miles from Mina, and it is reported that the company has relinquished its option on the property. Several hundred feet of development work was done, in driving two crosscut tunnels and a shallow shaft, without proving the downward continuation of the ore. Local people still consider the property well worth developing, and it is likely that further work will be done.

THE MARKET REPORT

Daily Prices of Metals

July	Copper, N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
19	14.25@14.375	37.75	38.375	6.075	6.00	6.05@6.10
20	14.35@14.50	38.75	39.25	6.075	6.00	6.05@6.10
21	14.375@14.50	39.25	39.75	6.075	6.00@6.10	6.10
23	14.375	39.25	39.625	6.30	6.125@6.25	6.10@6.125
24	14.375	39.125	39.625	6.30	6.25	6.10@6.125
25	14.375	38.50	39.00	6.30	6.35	6.125@6.15
Av.	14.383	38.771	39.271	6.188	6.140	6.102

*These prices correspond to the following quotations for copper delivered: July 19th, 14.50@14.625c.; 20th, 14.60@14.75c.; 21st, 14.625@14.75c.; 23d, 24th, and 25th, 14.625c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

July	Copper Standard Spot	Copper Standard 3M	Copper Electrolytic	Tin Spot	Tin 3M	Lead Spot	Lead 3M	Zinc Spot	Zinc 3M
19	65 5/8	66 3/8	72 1/2	179 1/2	180 3/4	24 1/8	23 5/8	29 3/8	29 1/4
20	65 7/8	66 5/8	72 3/4	183 1/8	184 1/8	24 1/2	24	29 3/4	29 5/8
23	65 1/2	66 1/4	72 3/4	186 1/2	187 5/8	24 1/2	24 1/8	30 1/4	29 7/8
24	65 7/8	66 5/8	72 3/4	187	187 3/4	24 5/8	24 3/8	30 3/4	30 1/2
25	65 5/8	66 3/8	72 1/2	185 1/4	186	24 3/8	24 1/4	30 1/2	30 1/4

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

July	Sterling Exchange "Checks"	Silver New York	Silver London	Gold London	July	Sterling Exchange "Checks"	Silver New York	Silver London	Gold London
19	4.59	63 1/4	31	89s 8d	23	4.59 3/8	63 1/2	31 1/8	89s 8d
20	4.59	63	30 15/16	89s 8d	24	4.59 1/4	63 1/8	30 15/16	89s 8d
21	4.59 1/4	63	30 15/16	.....	25	4.59 3/8	63 1/8	30 7/8	89s 8d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Markets

New York, July 25, 1923

No large transactions are reported in the metal markets during the last week, though numerous small orders have been placed and prices have held well. There is more optimism about higher prices than has been noted for some time. Dealers and speculators who watch the market closely seem particularly anxious to buy appreciable tonnages of lead, copper, and zinc, and feel that price advances are in order for all three of these metals, particularly lead.

Copper

Copper was sold as low as 14.50c. delivered last Wednesday and Thursday morning, but the metal available at that level was soon taken up, and fair tonnages were sold at 14⅝c., and small amounts at 14.75c., the same day. Most of the large producers have been holding at 14.75c. throughout the week, but have sold only in small volume, most of the business at that level being done on Friday and Saturday. In the last three days, copper has been obtainable from several sources at 14⅝c., and some business has been done at that level every day, but the total is not large. There is still no sign of the long-expected buying movement, and it is now expected to set in sometime between the first of August and the middle of September. It can hardly be postponed indefinitely, for consumers are by no means working on the small scale that would be indicated by their purchases during the last few months. Early deliveries will probably be in demand when the buying begins, but there is nothing to indicate that supplies will not be sufficient to take care of any reasonable inquiry.

The export demand during the last week has been better than for some time, and this, of course, has encouraged producers. Outside interests report a change of policy on the part of the Copper Export Association, which now has no set price, but is in active competition for all business at the best prices obtainable.

Forward prices on domestic business are the same as are asked for spot and prompt. Second-hands are generally holding above the prices at which producers are willing to do business.

Lead

The official contract price of the American Smelting & Refining Co. was advanced from 6 to 6.25c., New York, on Monday, July 23. The advance was generally expected by the trade, as no lead was available to the general public at the 6c. level. The same condition still exists, lead being held by outside interests at a considerable premium over the Smelting company's price.

The lead market was not particularly active on Thursday and Friday, though there was a good demand from dealers. Inquiries were numerous on Saturday and Monday, however, and were stimulated by the advance. The large producers were not anxious sellers and in no mood to sell to other than their regular customers. The orders, although numerous, were mostly from small consumers and were, in general, for August shipment. Dealers and speculative interests feel that lead is likely to approach 7c. again, and have bought all the lead they could lay their hands on, business at 6.50c. being done as early as Monday.

The demand in the Middle West has kept particularly strong and the market seems bare of supplies. Even the large consumers complain that they are unable to buy lead at the St. Louis prices that have been quoted by the metal papers in the last two or three days. Today, some sellers are quoting 6.50c., St. Louis. In Chicago yesterday, 6.30c. was paid for desilverized lead.

Zinc

Sales of zinc have been light and prices have fluctuated only slightly. Earlier in the week the metal was sold as low as 6.05c. per lb., although the general level of business was higher at 6.10c. A small lot of zinc was sold Monday for 6.125c. and today the same may be done, although the tendency is upward and it would not be surprising to find all the zinc available at the level quickly consumed. In fact, at least one producer is on a 6.15c. basis after having made a sale at 6.15c.

Present ore prices in the Joplin market do not allow smelters to work at a profit, or even to break even with zinc prices as they are. Consequently, the American Smelting & Refinining Co. announces the "dead-firing" of the Kusa plant and a partial curtailment of operations at Henryetta. The loss incurred by shutting down is held to be lower than that incurred while running the plant on present ore prices. Other smelters are expected to follow suit in curtailing production. There is a heavy accumulation of ores in the Joplin market.

One of the reasons why the zinc market has been poor is the absence of foreign demand, which did so much not long ago in stimulating sales. The strength of the London market and an inspection of the probable world supply for the European requirements has led one producer to believe that Europe will have to come to the United States again for its zinc. If that came to pass the market should be greatly strengthened.

High-grade zinc business has been satisfactory, with no let-up in the demand. The metal has been sold at 8@8½c. per lb., with usual freight allowances.

Tin

Demand has been better in the last few days, and consumers have participated in the market to a greater extent than for some time. Tin-plate interests have bought several 100-ton lots.

Arrivals of tin, in long tons: July 18th, Straits, 25; Australia, 5; 23d, Java, 25; Straits, 2,000; China, 200; Liverpool, 300; 24th, Liverpool, 100; total to July 24, 5,025.

Silver

The market has shown no particular tendency, but an advance occurred on the 23d due to Indian bazaar buying followed by an immediate reaction caused by China sales. India is still maintaining an open short account for forward delivery, and China is a moderate buyer for the same position. Under these conditions the future of silver is most uncertain.

Mexican Dollars—July 19th, 48¼; 20th, 48; 21st, 48; 23d, 48⅜; 24th, 48¼; 25th, 48⅛.

Foreign Exchange

On Tuesday, July 23, cable quotations on francs were 5.905c.; lire, 4.375c.; marks, 465,000 to the dollar; and Canadian dollars, 2⅝ per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 26@27c. per lb.; 98 per cent, 25@26c. London, £115, 98 per cent.

Antimony — Chinese and Japanese brands, 7@7¼c. W.C.C. brand, 8c. Cookson's "C" grade, 10@10.50c.

Bismuth—$2.55 per lb. London, 10s.

Cadmium—$1 per lb. London, 4s. 6d.

Cobalt—$3 per lb. for spot.

Iridium—$275@$300 per oz.

Nickel—27@32c. per lb. for 99 per cent virgin metal. London, £130 per long ton.

Palladium—$80@$81 per oz.

Platinum—$116 per oz. London, sponge, £23; manufactured, £25.

Quicksilver—$67 per 75-lb. flask. Quiet. San Francisco wires $66.50. London, £10 5s.

The prices of Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Selenium, Tellurium, Thallium, and Tungsten are unchanged from prices given July 7.

Metallic Ores

Chrome, Iron Ore, Magnetite, Manganese, Molybdenum, Titanium, Tungsten, Vanadium, and **Zircon Ore** are unchanged from the quotations published July 7.

Zinc and Lead Ore Markets

Joplin, Mo., July 21.—Zinc blende, per ton, high, $38.48; basis 60 per cent zinc, premium, $37@$37.50; Prime Western, $36@$37; fines and slimes, $35@$33; average settling price, all zinc ores, $36.97.

Lead, high, $77.30; basis 80 per cent lead, $70@$60; average settling price, all lead ores, $74.73 per ton.

Shipments for the week: Blende, 6,532; lead, 816 tons. Value, all ores the week, $302,510.

It was anticipated by buyers up to noon today that sellers would freely accept offers of $34@$35 for Prime Western grades of zinc blende, but sellers held firm for higher prices, with a compromise as above quoted.

Production appears to be held at approximately 8,000 tons, with mines in operation working by five days' mill production. A fourth of the production is restricted by the number of largest producing mills remaining idle.

Platteville, Wis., July 21.—Blende, basis 60 per cent zinc, $42 per ton. Lead, basis 80 per cent lead, $70 per ton. Shipments for the week: Blende, 452 tons; lead, none. Shipments for the year: Blende, 18,818; lead, 460 tons. Shipments for the week to separating plants, 1,066 tons blende.

Non-Metallic Minerals

Fluorspar—Washed gravel, plus 85 per cent CaF_2, minus 5 per cent SiO_2, $23.50 per ton, Illinois; acid lump, $42 per ton. Market quiet. For other quotations, see July 7 issue.

Talc—In New York, double air-floated, $14.75 per ton. Market good.

In California, 200 mesh, "Sierra Snow," $18 per ton, bags extra. "Sierra Cloud," air floated, $25 per ton. Market fair.

Other talc quotations in July 7 issue.

Asbestos, Barytes, Bauxite, Borax, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fuller's Earth, Graphite, Gypsum, Limestone, Magnesite, Manjak, Mica, Monazite, Phosphate, Pumice, Pyrites, Silica, Sulphur, and **Tripoli** are unchanged from the July 7 prices.

Mineral Products

Arsenious Oxide (white arsenic)—10c. per lb., delivered over the balance of the year.

Copper Sulphate—5.40@5.45c. for large crystals, domestic product.

Sodium Nitrate—$2.45 per 100 lb., ex-vessel, Atlantic ports.

Potassium Sulphate and **Sodium Sulphate** are unchanged from quotations of July 7.

Ferro-Alloys

Ferromanganese—Domestic and imported, $117.50 per long ton. Spiegeleisen unchanged from July 7 prices.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and **Ferrovanadium** are unchanged from the prices published July 7.

Metal Products

Rolled Copper—Sheets, 23.75c., base; wire, 17.50c.

Lead Sheets, Nickel Silver, Yellow Metal, and **Zinc Sheets** are unchanged from the prices given in the July 7 issue.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick and **Zirkite** are unchanged from the July 7 prices.

The Iron Trade

Pittsburgh, July 24, 1923

The finished steel price structure remains intact with no changes in prices. Orders are relatively light, but a moderate amount of business is being placed.

Steel production is now 15 to 20 per cent below the top rate. There is no decided decrease in manufacturing or building operations involving the use of steel.

Pig Iron.—Quotable prices remain at $26.50 for bessemer, $25 for basic, and $25.50@$26, Valley, for foundry. The market is remarkably stagnant.

Connellsville Coke.—With continued blowing out of furnaces, production of coke has been curtailed, but perhaps not altogether fast enough. Market quotations are unchanged at $4,75@$5 for furnace and $5.50@$6 for foundry.

COMPANY REPORTS

Park Utah Mining Co.

Silver, Lead; Park City, Utah

A report of the operations of the Park Utah Mining Co. for 1922 and the first quarter of 1923 follows:

Balance Jan. 1, 1922		$31,343.63
Receipts		
Ore sales 42,807 tons @ $35.00	$1,503,706.52	
Sale treasury stock	60,375.00	
Interest on deposits and bonds	6,077.96	
Miscellaneous receipts	2,284.45	
		1,572,443.93
		$1,603,787.56
Disbursements		
Mine account	$200,483.31	
Ore expense		
Sampling and assaying	26,338.03	
Hauling	93,612.42	
Prospecting	178,152.48	
General		
Engineering	13,338.40	
Liability and fire insurance	15,791.87	
General office, salaries, rent, stationery, postage	13,596.38	
Listing and transfer agent	1,634.70	
Legal	554.40	
Sundries	487.59	
Taxes	17,182.14	
Construction	196,798.10	
	$757,969.82	
Property purchase	25,346.40	
Dividends Nos. 2-3-4-5	497,962.50	
	$1,281,278.72	
Liberty bonds and accrued interest	181,293.01	
Cash on hand Jan. 1, 1923	141,215.83	
		$1,603,787.56
Assets		
Cash on hand Jan. 1, 1923	$141,215.83	
Liberty bonds and accrued interest	181,293.01	
Balance Jan. 1, 1923		$322,508.84
		Shares
Daly Mining Co. stock		42,057

Statement for Year 1922

	Dry Tons
Crude ore sold	42,807

Average Ore Valuation per Ton

	Dry Tons	Silver, Oz.	Gold, Oz.	Per Cent Lead	Per Cent Copper	Sold For
Crude ore	42,807	50.30	0.078	0.74	0.25	$35.13

Cutput Since Incorporation

	Dry Tons	Silver, Oz.	Gold, Oz.	Lead, Lb.	Copper, Lb.	Sold For	Dividends
To 1922	5,820	413,016	818.98	203,948	5,601	$317,942.37	$48,074.25
In 1922	42,807	2,153,534	3,383.63	634,021	21,403	1,503,706.52	497,962.50
Total	48,627	2,566,550	4,202.61	837,969	27,004	$1,821,648.89	$546,036.75

The company's financial statement follows:

Jan., Feb. and March, 1923

Balance Jan. 1, 1923		$322,508.84
Receipts		
Ore sales		
Crude 22,171 tons @ $34.79	$771,396.10	
Interest on deposits and bonds	3,481.86	
	$774,877.96	
Expenditures		
Operation	$245,036.98	
Construction	19,710.02	
	$264,747.00	
Receipts over expenditures	$510,130.96	
Dividend No. 6	150,000.00	360,130.96
		$682,639.80
Balances available		
Cash on deposit	$442,174.79	
Liberty bonds and accrued interest	240,465.01	
Balance April 1, 1923		$682,639.80

Oriental Consolidated Mining Co.

Gold; Unsan District, Korea

A report of the operations of the Oriental Consolidated Mining Co. in the Unsan district of Chosen (Korea), Empire of Japan, for the year ending Dec. 31, 1922, follows:

Total receipts		$991,114.08 or	$4.79 per ton
Total operating costs		800,322.83 or	3.87 per ton
Total operating profits before reserves		$190,791.25 or	$0.92 per ton
Reserves for			
Depreciation	$250,000.00		
Depletion	48,931.64		
	298,931.64 or		1.45 per ton
Net loss after deductions for reserves	$108,140.39		$0.53 per ton

The sum of $109,813.23 was expended for new construction and development, and has been added to the new construction and development account.

During the first two months of 1922 expenses exceeded receipts, but each of the subsequent months has shown a profit. Plenty of rain during 1922 enabled the company to operate its plants on electric power the greater part of the year.

The much needed new Tabowie shaft was completed during 1922. Extensive underground repairs and a serious labor shortage forced the company to run the Tabowie mill at only half capacity until late in the fall, so that tonnage and receipts for the year were small.

Construction and development costs were increased 36c. per ton, but operating costs were reduced 55c. per ton, and total expenses were 19c. per ton lower for 1922 than for the year before.

Profit-and-Loss Account

206,688 Tons of Ore Mined and Milled

Dr.	Cost per Ton	
To mining costs	$2.59	$535,024.95
Milling costs	.55	114,907.06
Concentration expenses	.21	43,210.76
Transportation of ore	.02	4,667.52
General expenses	.50	102,512.53
Total operating and general expenses	$3.87	$800,322.83
Depreciation	1.21	250,000.00
Depletion, 5 per cent of output	.24	48,931.64
Total debits	$5.32	$1,099,254.47
Loss for year to balance sheet	.53	108,140.39
	$4.79	$991,114.08
Cr.		
By bullion from mines	$2.29	$472,719.63
Concentrates	2.44	505,913.10
Interest and other receipts	.06	12,481.35
	$4.79	$991,114.08

Balance Sheet as at Dec. 31, 1922

Capital and Liabilities

To capital stock		$5,000,000.00	
Less unissued stock		706,100.00	
			$4,293,900.00
Sundry creditors			40,808.12
Surplus and reserves:			
Deficit, Dec. 31, 1922		$175,881.04	
Add: United States income tax paid		14,934.77	
Loss for 1922, from profit-and-loss account		108,140.39	
Deficit surplus, Dec. 31, 1922		$298,956.20	
Reserve for			
Depreciation	$2,075,000.00		
Depletion	732,558.04		
	$2,807,558.04		
Net surplus and reserves			2,508,601.83
			$6,843,309.95

Property and Assets

By mines and property	$4,293,900.00
New construction and development	1,139,582.37
Plant and equipment additions	750,000.00
Cash	283,732.12
Sundry debtors	153,966.74
Supplies	203,339.02
Tax 1923, paid in advance	12,500.00
Insurance, paid in advance	6,289.70
	$6,843,309.95

Facts for the Stockholder

XXIV—American Zinc, Lead & Smelting Co.

THE American Zinc, Lead & Smelting Co. was incorporated in Maine, June 26, 1899. It is engaged in developing and operating mines and mineral lands, and in mining and milling zinc and lead ores. It has the powers of a holding company, and owns the outstanding capital stock of the American Zinc Co. of Tennessee, the American Zinc Co. of Illinois, the American Limestone Co., the American Zinc Ore Separating Co., the American Zinc Co. of Arkansas, the American Zinc Oxide Co. and the American Zinc Sales Co. It owns 649,774 of the 925,000 shares of the Wisconsin Zinc Co., and a controlling interest in the Silver Dyke Mining Co. and properties formerly owned by the Granby Mining & Smelting Co. in the Joplin district of Missouri, in Illinois, and in Kansas.

The principal mining operations of the American Zinc Co. of Tennessee are at Mascot, Knox County, Tenn., where it owns in fee about 2,400 acres, and in Jefferson County, Tenn., where it owns the mineral rights to about 450 acres.

The mines of the Wisconsin Zinc Co. occur in limestone and vary in depth from 150 to 250 ft., the orebodies varying in length from 1,000 to 5,000 ft., height from 12 to 60 ft., and width from 30 to 300 ft. The company owns a roasting and magnetic separating plant. The chief operations are at the Champion property, comprising 434 acres, on which an orebody has been developed 1,500 ft. long, 800 ft. wide, and 40 ft. high, equipped with a mill having a capacity of 500 tons daily. The company also owns the Winskell mine, with a mill of 450 tons' daily capacity; and the Longhorn, Thompson, Blackstone, and Copeland properties, each of which has a 350-ton mill. The company's roasting plant near the Champion property has a capacity of about 200 tons of ore daily, producing finished concentrates assaying 58 to 60 per cent zinc.

The American Zinc Co. of Illinois owns 600 acres of land at Hillsboro, Ill., on which is a modern smelting plant of 4,800 retorts, with a capacity of 48,000 tons of concentrate per annum; a sulphuric acid plant capable of producin 45,000 tons of 60 deg. acid annually, and a zinc oxide plant of twenty-four furnaces. Property at East St. Louis consists of 143 acres, on which is a smelting plant of 5,600 retorts capable of treating 54,000 tons of concentrates annually, a 60 deg. sulphuric acid plant of 30,000 tons' capacity, and a 66 deg. sulphuric acid plant of 12,000 tons' capacity. It also owns about 10,000 acres of coal lands in Bond County, Ill.

The American Limestone Co. disposes of mill tailing from the Mascot plant of the American Zinc Co. of Tennessee for railroad ballast and road construction, and sells flotation tailing for fertilizer purposes.

The American Zinc Oxide Co. owns fifty acres of land at Columbus, Ohio, on which is a modern zinc oxide plant of twenty-two furnaces. This company also owns a plant for roasting zinc ores, delivering its sulphur fumes to an adjacent sulphuric acid plant not owned by the company.

Issued capitalization of American Zinc, Lead & Smelting Co. consists of 96,560 shares of preferred stock (of which 80,330 shares are in the hands of the public), cumulative, par value $25; and 193,120 shares of common stock, par value $25. Preferred stock has preference as to assets as well as dividends, which are limited to $6 per share, per annum; is subject to redemption as a whole, but not in part, at $100 a share and accrued dividends on any dividend date upon 30 days' notice; and on liquidation is entitled to receive $100 a share and accrued dividends. Preferred stock has no voting power on the question of increase of common stock. No mortgage can be placed on the property, and no increase can be made in preferred, without vote of a majority of both common and preferred shares outstanding.

Funded debt consists of $1,152,600 Granby Mining & Smelting Co. first mortgage 5 per cent bonds, due 1926, covering certain assets taken over from that company. The company has guaranteed unconditionally, principal, interest, and sinking fund, an issue of $600,000 7 per cent sinking-fund debenture notes of the Silver Dyke Mining Co., its subsidiary.

The company's irregular net income record during th last ten years has been as follows: Income, $296,000 in 1912; a deficit of $219,000 in 1913; income, $65,000 in 1914, $2,651,000 in 1915, $7,302,000 in 1916, $921,000 in 1917, $357,000 in 1918; deficits of $181,000 in 1919, $536,000 in 1920, and $639,000 in 1921; net income of $21,900 in 1922.

Dividends on the preferred have been paid at the rate of 12 per cent in 1916, and 24 per cent in 1917, 1918, 1919, and 1920, the last payment being $1.50 a share, Nov. 1, 1920. In 1916, common shareholders received a dividend of 50 per cent in preferred stock, cash dividends amounting to 8 per cent in 1917, the last payment being $1 a share in May, 1917.

On Dec. 31, 1922, total current assets were $2,668,000, compared with current liabilities of $465,000, leaving net working capital at $2,203,000.

Price range of stock has been as follows: Preferred. high 87, in 1916; low 22⅞ in 1921; closing price 35 bid, 37 asked, July 24, 1923. Common, high 97⅞ in 1916; low 6⅜ in 1921; closing price 9⅞, July 24, 1923. INVESTIGATOR.

Mining Dividends in July

The following dividends were paid by mining and metallurgical companies in July, 1923:

Companies in the United States	Situation	Per Share	Total
Anaconda Copper	Mont.	$0.75 Q	$2,250,000
Arizona Commercial, c.	Ariz.	0.50	132,500
Bethlehem Steel	U. S.	1.25 Q	845,106
Columbus Rexall, s.l.	Utah	0.05	29,312
Homestake Mining, g.	S. D.	0.50 M	125,580
Inland Steel, pfd.	Minn.	1.75 Q	.....
Inspiration Consolidated, c.	Ariz.	0.50 Q	590,983
Iron Blossom Consolidated, s.c.l.	Utah	0.025 Q	25,000
Kennecott Copper	Alaska	0.75 Q	2,090,341
Park City, s.l.z.	Utah	0.125 Q	109,500
Park Utah, s.l.	Utah	0.15 Q	150,000
Phelps Dodge, c.	U. S. and Mex.	1.00 Q	500,000
Republic Iron & Steel, pfd.	U. S.	3.75 Q	937,500
Silver King Coalition, s. l. z.	Utah	0.20 Q	243,220
Sloss-Sheffield Steel & Iron, pfd.	Ala.	1.75 Q	117,250
Tennessee Copper & Chemical	Tenn.	0.25 Q	200,000
Tonopah Extension, s. g.	Nev.	0.05 Q	69,636
United Eastern, g.	Ariz.	0.15 Q	204,450
U.S.Smelting, Ref. & Mng.,pfd., s. l.	U. S. and Mex.	0.875 Q	425,556
Virginia Iron, Coal & Coke	U. S.	2.00	200,000
Virginia Iron, Coal & Coke, pfd.	U. S.	2.50 SA	125,000
Companies in other countries			
Asbestos Corporation	Quebec	1.50 Q	45,000
Asbestos Corporation, pfd.	Quebec	1.75 Q	70,000
Dolores Esperanza, g. s.	Chi., Son.	0.05 Q	43,248
Dome Mines, g.	Ont.	1.00 Q	476,667
Frontino & Bolivia Gold	Colombia	1 sh	£7,000
Hollinger Consolidated Gold	Ont.	0.05 4 wks.	$246,000
Howe Sound, c.	B. C.	0.05	99,207
Kerr Lake, s.	Ont.	0.125 Q	75,000
Lucky Tiger-Combination, c. s.	Sonora	0.10	71,534
N. Y. & Honduras Rosario, g. s.	Honduras	0.25 Q	50,000
Nipissing, s.	Ont.	0.15 Q	180,000
Premier Gold	B. C.	0.08 Q	400,000
Silversmith Mines, s. l. z.	B. C.	0.02 Q	50,000
Sinaloa Explor. & Development		5.00	.....

Q, quarterly; SA, semi-annually; M, monthly; g, gold; s, silver; c, copper; l, lead; z, zinc.

The disbursements for July total approximately the same as those paid for the preceding quarter, in April. Arizona Commercial paid a dividend for the first time since October, 1918; Columbus Rexall had paid nothing since August, 1922; Republic Iron & Steel is paying up back dividends on the preferred stock; Silver King Coalition paid 20c. instead of 15c. as in April; Dome paid $1 instead of 50c.; Howe Sound again enters the dividend ranks after its disastrous fire; the Lucky Tiger-Combination paid a special extra dividend for the second quarter of 3c., compared with 1c. before; and Silversmith paid 2c. instead of 1c.

On the other hand, no dividends are reported from California Rand Silver, Cresson Consolidated Gold, Eagle-Picher preferred, Tonopah Belmont Development, Tonopah Mining, Erupcion, and Wright,Hargreaves, all of which made payments in April. Tonopah Extension reduced its dividend from 10c. to 5c., and the Premier was able to find only 8c. per share, compared with 10c. before.

MINING STOCKS

Week Ended July 21, 1923

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Ahmeek	Boston	62¼	60	61¼	June 23, Q	$1.50
Alaska-Br. Col.	N. Y. Curb	....	....	1⅛	....	....
Allouez	Boston	21	19	20	Mar. '19	1.00
Anaconda	New York	42¼	39⅝	42	Je. 16, Jy. 23	0.75
Arcadian Consol.	Boston	1⅛	1⅛	1⅛	....	....
Ariz. Com'l.	Boston	10⅜	10¼	10¼	July '23,	0.50
Calaveras	N. Y. Curb	2⅜	2⅛	2⅛	....	....
Calumet & Arizona	Boston	50	47½	49½	June '23,	1.00
Cal. & Hecla (New)	Boston	43½	42	43	June '23, Q	10.00
Centennial	Boston	†9	†8	8½	Dec. '18, SA	1.00
Cerro de Pasco	New York	41⅛	39	41	Jy. 19, Au. 1	1.00
Chile Copper	New York	27	25½	26⅞	Je. 2, Je.30 Q	0.62½
Chino	New York	20⅜	18¾	20½	Sept. '20, Q	0.37½
Con. Coppermines	N. Y. Curb	2⅛	2¼	2¼	....	....
Copper Range	Boston	34	31⅛	33⅜	May '23, Q	1.00
Crystal Copper	Boston Curb	*78	*63	*63	....	....
Davis-Daly	Boston	2¾	2¾	2¾	Mar. '20, Q	0.25
East Butte	Boston	6½	6¼	6¼	Dec. '19, A	0.50
First National	Boston Curb	*35	*30	*35	Feb. '19, SA	0.15
Franklin	Boston	1¼	1 3/16	1¼	....	....
Gadsden Copper	Boston Curb	*55	*50	*55	....	....
Granby Consol.	New York	21	19½	21	May '19, Q	1.25
Greene-Cananea	New York	18½	18½	18½	Nov. '20, Q	0.50
Hancock	Boston	2⅜	2	2⅛	....	....
Howe Sound	N. Y. Curb	3½	3	3	Jy. 2, Jy.16	0.05
Inspiration Consol.	New York	31⅜	29½	31	Je.14, Jy. 2 Q	0.50
Iron Cap	Boston Curb	4½	4½	4½	May 23, K	0.15
Isle Royale	Boston	26	22	26	June '23, Q	0.50
Kennecott	New York	35⅜	33¼	35¼	Je. 8, Jy. 2 Q	0.75
Keweenaw	Boston	1	*95	*95	....	....
Lake Copper	Boston	2⅜	2	2¼	....	....
Magma Copper	New York	32½	30	32	Jan. '19, Q	0.50
Mason Valley	N. Y. Curb	1⅜	1⅜	1⅜	....	....
Mass Consolidated	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	1.00
Miami Copper	New York	25	23½	25	Au. 1, Au. 15, Q	0.50
Michigan	Boston	2⅜	1⅞	2⅛	....	....
Mohawk	Boston	46½	42	46½	June '23, Q	1.00
Mother Lode Coa.	New York	9⅞	8⅜	9⅞	Je. 8, Je. 30, Q	0.50
Nevada Consol.	New York	12¼	11⅜	12½	Sept. '20, Q	0.25
New Cornelia	Boston	18⅜	17½	18⅛	Au. 3, Au. 20, Q	0.25
North Butte	Boston	3⅛	3⅛	3⅜	Oct. '18, Q	0.25
Ohio Copper	N. Y. Curb	*74	*65	*65	....	....
Old Dominion	Boston	22	21	22	Dec. '18, Q	1.00
Osceola	Boston	32	30	31½	June '23, Q	1.00
Phelps Dodge	Open Mar.	†170	†160	.....	Je. 20, Jy. 2 Q	1.00
Quincy	Boston	31½	27	31½	Mar. '20, Q	1.00
Ray Consolidated	New York	11⅜	11	11⅛	Dec. '20, Q	0.25
Ray Hercules	N. Y. Curb	1⅛	1	1	....	....
St. Mary's Min. Ld.	Boston	38	35	37	Mar. '23, K	3.00
Seneca Copper	New York	8¼	7½	8⅛	....	....
Shannon	Boston	*55	*50	*55	Nov. '17, Q	0.25
Shattuck Arizona	New York	7	5¾	7	Jan. '20, Q	0.25
South Lake	Boston	*†15	....	*12	....	....
Superior & Boston	Boston	1⅛	1⅛	1⅛	....	....
Tenn. C. & C. cfs.	New York	9⅛	9⅛	9⅛	Je. 30, Jy. 16, Q	0.25
Tuolumne	Boston	*14	*14	*14	May '13,	0.10
United Verde Ex.	N. Y. Curb	31⅛	30⅛	31⅛	Jy. 5, Au. 7, Q	1.00
Utah Consol.	Boston	2	2	2	Sept '18,	0.25
Utah Copper	New York	61	57⅞	60⅛	Je. 8, Je. 30, Q	1.00
Utah Metal & T.	Boston	*75	*70	*75	Dec. '17,	0.30
Victoria	Boston	†1	†*75	*75	....	....
Winona	Boston	*50	*40	*40	....	....
Wolverine	Boston	8⅛	7	7	....	....
NICKEL-COPPER						
Internat. Nickel	New York	13⅜	12⅛	13⅜	Mar.' 19,	0.50
Internat. Nickel pfd.	New York	80	80	80	Jy. 19, Au. 1	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	3	3	3	....	....
National Lead	New York	118⅜	113	118⅜	Je.15, Je.30 Q	2.00
National Lead pfd.	New York	110	109⅜	110	June '23, Q,	1.75
St. Joseph Lead	New York	18⅛	18	18⅛	Se.9, Se.20 Q, X	0.50
ZINC						
Am. Z. L. & S.	New York	10⅛	9	10⅛	May '20,	1.00
Am. Z. L. & S. pfd.	New York	35⅛	34⅞	35	Nov. '20, Q	1.50
Butte C. & Z.	New York	6⅛	6	6⅛	Mar. '23,	0.50
Butte & Superior	New York	22⅜	20	22	Je. 15, Je. 30, Q	0.50
Callahan Zn-Ld	New York	6⅛	5⅜	6⅛	Dec. '20, Q	0.50
New Jersey Zn.	N. Y. Curb	154	151½	154	Jy.31, Au.10 Q	2.00
United Zinc	N. Y. Curb	*80	*80	*80	....	....
Yellow Pine	Los Angeles	*60	*60	*60	June '23, Q	0.03
SILVER						
Alvarado	N. Y. Curb	3⅛	3⅛	3⅛	....	....
Batopilas Mining	New York	⅛	⅛	⅛	Dec. '07, I	0.12½
Beaver Consol.	Toronto	*36	*31½	*35	May '20, K	0.03
Candelaria	N. Y. Curb	*9	*7	*7	....	....
Castle-Trethewey	Toronto	*26	*24	*25	....	....
Coniagas	Toronto	3	2.70	3	May '21, Q	0.12½
Crown Reserve	Toronto	*57½	*54	*57	Jan. '17,	0.05
Hilltop-Nev.	N. Y. Curb.	1 3/16	*90	*99	....	....
Kerr Lake	N. Y. Curb	2¼	2	2¼	Jy. 2, Jy. 16, Q	0.12½
La Rose	Toronto	*30	*30	*30	Apr. '22,	0.10
McKinley-Dar.-Sav.	Toronto	*18	*17½	*17½	Oct. '20, Q	0.03
Mining Corp. Can.	Toronto	2.20	2.05	2.05	Sept. '20, Q	0.12½
Nipissing	N. Y. Curb	5⅜	5⅛	5⅛	Jy. 1, Jy.20 Q	0.15
Ontario Silver	New York	3	3	3	Jan. '19, Q	0.50
Temiskaming	Toronto	*43	*38	*38	Jan. '20, K	0.04

Stock	Exch.	High	Low	Last		Last Div.
GOLD						
Alaska Gold	New York	⅜	⅜	⅜	....	....
Alaska Juneau	New York	1⅛	1	1⅛	....	....
Boundary Red M.	N. Y. Curb	*15	*15	1*5	....	....
Carson Hill	Boston	6	5⅞	6	....	....
Cresson Consol. G.	N. Y. Curb	3⅜	3⅛	3⅜	Apr. '23 Q	0.10
Dome Mines	New York	36	34⅝	36	Je.30, Jy.20 Q	1.00
Golden Cycle	Colo. Springs	....	....	1.04	Dec. '22, Q	0.02
Hollinger Consol.	Toronto	12.15	12.05	12.15	Jy.26, Au.13 M	0.05
Homestake Mining	New York	63	63	63	Jy.20, Jy.25 M	0.50
Kirkland Lake	Toronto	*35	*32½	*35	....	....
Lake Shore	Toronto	3.50	3.35	3.50	May '23, Q	0.02
McIntyre-Porcupine	New York	17	16⅜	16⅜	Au.1, Se.1, Q	0.25
Portland	Colo. Springs	....	....	*35	Oct. '20, Q	0.01
Teck-Hughes	N. Y. Curb	1⅜	1⅛	1 1/16	....	....
Tom Reed	Los Angeles	*46	*45	*42	Dec. '19,	0.02
United Eastern	N. Y. Curb	1 1/16	1 1/16	1⅛	Jy. '28, Q	0.15
Vipond Cons.	Toronto	*63	*62	*63	....	....
Wright-Hargreaves	Toronto	3.25	3.15	3.15	Apr. '23,	0.02½
Yukon Gold	N. Y. Curb	1¼	1¼	1¼	June '18,	0.02½
GOLD AND SILVER						
Boston-Mont. Corp.	N. Y. Curb	*14	*13	*14	....	....
Con. Cortez	N. Y. Curb	*68	*66	*68	....	....
Cons. Virginia	San Francisco	9½	9½	9½	....	....
Continental Mines	N. Y. Curb	5¼	4⅞	5⅛	....	....
Dolores Esperanza	N. Y. Curb	1⅜	1 1/16	1⅜	Jy. 1, Jy.10 Q	0.05
Jib Consol.	N. Y. Curb	....	....	*70	....	....
Tonopah Belmont	N. Y. Curb	*73	*70	*72	Apr. '23, Q	0.05
Tonopah Divide	N. Y. Curb	*54	*50	*54	May 23	0.10
Tonopah Extension	N. Y. Curb	1 1/16	1 1/16	1 1/16	Je. 9, Jy. 2	0.05
Tonopah Mining	N. Y. Curb	1⅜	1 1/16	1 1/16	Apr. '23, Q	0.07½
Unity Gold	N. Y. Curb	3⅜	3	3⅜	....	....
West End Consol.	N. Y. Curb	*80	*77	*80	Mar. '23, Q	0.05
SILVER-LEAD						
Bingham Mines	Boston	†*17	†*16	*16½	Sept. 19, Q	0.25
Cardiff M. & M.	Salt Lake	*58	*56	*56	Dec. '20,	0.15
Chief Consol.	Boston Curb	3⅜	3¼	3¼	May '23, Q	0.10
Columbus Rexall	Salt Lake	*42	*38	*40	Aug. '22,	0.03
Consol. M. & S.	Montreal	25	25	25	Oct. '20, Q	0.62½
Erupcion	Boston Curb	2⅜	2⅛	2⅜	Apr. '23, Q	0.125
Federal M. & S.	New York	†10	†8	8	Jan. '09,	1.50
Federal M. & S. pfd.	New York	38⅛	37⅞	38⅛	June '23, Q	1.75
Florence Silver	Spokane	....	....	*38	Apr. '19, Q, X	0.01½
Hecla Mining	N. Y. Curb	6⅛	5⅞	6⅛	Je. 15 Q	0.50
Iron Blossom Con.	N. Y. Curb	*24	*23	*23	July 16,	0.02½
Marsh Mines	N. Y. Curb	....	....	*6	June '21, I	0.02
Park City	Salt Lake	....	....	3.25	Je.15, Jy.2 Q	0.12½
Park Utah	N. Y. Curb	....	....	3⅛	Je.15, Jy.2 Q	0.15
Prince Consol.	Salt Lake	*3⅛	*2	*2	Nov. '17,	0.02½
Silversmith	Spokane	....	....	*38	Jy. 2, Jy. 10	0.02
Simon Silver-Lead	N. Y. Curb	*25	*25	*25	....	....
Snowstorm Silver-L.	N. Y. Curb	....	....	*43	....	....
Tamarack-Custer	Spokane	....	....	1.25	Je.30, K	0.02
Tintic Standard	Salt Lake	2.95	2.85	2.90	July '23	0.15
Utah-Apex	Boston	3⅛	3⅛	3⅛	June '23, Q, X	0.50
IRON						
Bethlehem Steel	New York	48¾	44½	48¾	Je. 1, Jy. 2 Q	1.25
Char. Iron	Detroit	1	1	1	....	....
Char. Iron pfd.	Detroit	1⅜	1⅜	1⅜	....	....
Colorado Fuel & Iron	New York	29¾	27¼	29	May '23, Q	2.00
Col. Fuel & Iron pfd.	New York	....	....	102	Feb. '23, Q	2.00
Gt. North'n Iron Ore	New York	29⅜	28⅛	29⅜	Apr. '23	1.00
Inland Steel	N. Y. Curb	....	....	46½	June '23 Q	0.62½
Mesabi Iron	N. Y. Curb	7½	7	....	....	....
Replogle Steel	New York	15⅛	14⅛	14⅛	....	....
Republic I. & S.	New York	47	43	45⅝	May '21	1.50
Republic I. S. pfd.	New York	93½	89	93½	Se.15, Oc.1 Q	3.75
Sloss-Sheffield S. & I.	New York	45	42	45	Feb. '21	1.50
Sloss-Shef. S.&I. pfd.	New York	†84	†75	78	Je. 22, Jy. 2 Q	1.75
U. S. Steel	New York	92⅜	89⅛	92⅛	Je.29, Q	1.25
U. S. Steel pfd.	New York	118	117¾	118	May '23	1.75
Virginia I. C. & C.	New York	57	56	57	Je.16, Jy. 2	2.00
Virginia I.C.&C.pfd.	New York	79	79	79	Je.16, Jy. 2	2.50
VANADIUM						
Vanadium Corp.	New York	32⅜	30⅛	30⅛	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	61¼	51⅛	51⅜	Je.30, Jy.15 Q	1.50
Asbestos Corp. pfd.	Montreal	....	....	75	Je.30, Jy.15 Q	1.75
SULPHUR						
Freeport Texas	New York	12⅜	11⅛	12⅜	Nov. '19, Q	1.00
Texas Gulf	New York	59	56½	58	June '23, Q	1.50
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	3⅛	3⅛	3⅛	....	....
MINING, SMELTING AND REFINING						
Amer. Metal	New York	45	43¼	44⅛	Je. 1, Q	0.75
Amer. Metal pfd.	New York	....	....	107⅛	Je. 1, Q	1.75
Amer. Sm. & Ref.	New York	58⅛	54¼	58⅛	Jy. 9, Au. 1	1.25
Amer. Sm.& Ref. pfd	New York	96	96	96	Au.10, Se.1 Q	1.75
U. S. Sm. R. & M.	New York	27⅜	24	27	Jan. '21, Q	0.50
U.S. Sm.R.& M. pfd.	New York	†43½	†42	41½	Jy.6, Jy.14 Q	0.87½

*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Arthur E. Moysey; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Mines and Oil; Colorado Springs, Colorado Springs Stock Exchange.

INDUSTRIAL NOTES

Making Leather Belts Endless

By Louis W. Arny

The weak point of every belt is the joining of the two ends. Not only is it the weak point, but also it is the point of most belt trouble. There are a multiplicity of devices for joining these ends, from the old lace-leather-sewn joint to the endless variety of metal fastenings. Some of these are better than others, but all of them are subject to the following objections:

They break. They tear out the ends of the belt. If metal, they make a clatter in going over the pulley. If leather, they form a hump, which pounds on the pulleys. If metal, they may be dangerous to the workman. They interrupt the continuity of the flow of power. They require frequent renewals. If not very carefully adjusted, they make probable a crook in the belt at the joint.

These are all serious defects, small in themselves, perhaps, but aggregating, where there are many belts, a large amount of lost time and annoyance. "The total depravity of inanimate things" always causes a belt fastening to fail at the most inopportune time, when the loss and the annoyance are greatest.

The remedy for all this annoyance lies in using only endless belts—that is, those in which the two ends of the belt are joined to make a continuous length. Almost any kind of belt can be made endless at its factory, by the manufacturer who made it, and where an endless belt can be placed around the pulleys without an expenditure of too much time and effort, and where there is provision for taking up the stretch, new belts should be ordered "made endless" when purchased. Where it is necessary to take down shafting and pulleys to install such a belt, or where there is no provision for taking up the stretch, a belt made endless at the factory is of no use. Some belts can be made endless on the pulleys satisfactorily, and some cannot. This article applies only to those which can be made endless on the pulleys satisfactorily—namely the leather belts.

Making a belt endless on the pulleys is like many another job, in that it appears difficult and complicated, but when once the trick is learned, it is remarkably simple, and the handy man of the shop, or any man accustomed to use carpenter tools, can learn it, and can make all the belts in the shop endless, and "take them up" when occasion requires, besides making any other repairs that may be necessary. The aggregate cost of making and maintaining endless belts will not be materially different from the cost of using fasteners.

The tools required are listed in the accompanying table. Some of these tools already are in the shop, and all of them, or any of them, may be obtained from any leather belting manufacturer. There is only one of them that is unusual to the ordinary mechanic—the turned edge scraper. This is a flat piece of good steel, about the thickness and quality of good saw steel, and is fitted in a handle as shown. The point about this tool is that it works with an edge which is turned at a right angle to the blade. This is accomplished by grinding a long edge, then rubbing this down to a fine edge on a "clearing stone," then, with a smooth, hard, steel tool, turning this edge so that its cutting edge is at right angles to the blade. With the tool firmly held in a vise, pressure is applied on one side. When the edge is smoothly and uniformly turned to the angle shown, the angle of the steel tool is changed, and the process repeated, and then it is completed by using the steel tool at right angles to the blade.

Clamps and rods.	Awl.
Belt scraper.	Drive punch.
Slicker.	Blind punch.
Belt hoe.	Staple puller.
Belt shave.	Glue kettle.
Spokeshave.	Ripping hammer.
Long skiver.	Screw-driver.
Heel chop.	Pegging hammer.
Knife sharpener.	Hand punch.
Steel sharpener.	3½-in. best glue brush

Safety copper glue kettle.

Rough cutting with spokeshave after marking heel of lap with square

Coming down to a fine point with scraper

There is a small steel tool, the sharpener, round, slightly tapered, with a smooth, hard point, which is used to keep this turned edge in good cutting condition, by rubbing its point on the under side of the turned edge, and its surface on the upper side. These turned edges are fairly durable, in working in leather, but when they are gone it is necessary to grind the tool again, and repeat the process of forming the edge.

The scraper is one of the most important tools in the belt maker's kit, because it saves much time in cutting laps, and because with its use it is possible to scrape down a lap to an even bevel, and to make sharp points on the laps.

Working down to a rough point

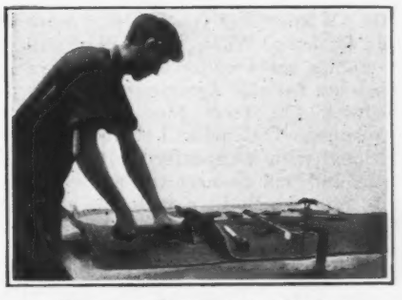
Making Laps

As to making the laps, first decide on the length of the lap desired. Generally speaking, it is wise to make a new lap of the same length as the others in the belt, though in the case of double belts this may be varied to suit the conditions. One lap should not be made over another lap, and it may be necessary to make a lap longer or shorter to avoid this.

The things to be remembered are that the line of the point and the line of the heel must be exactly square with the edge of the belt, and that the bevel from heel to point must be uniform and regular, and that there must be no "humps," especially back of the point, to prevent the proper adhesion of the cement at every point of contact.

Finishing tip of point with a knife

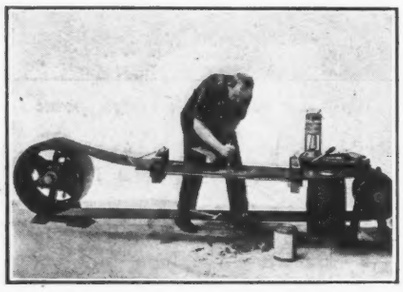
Clamp the belt to the table, so that both hands are free for the use of tools. Measure the lap desired, and mark across the belt a line drawn with the use of the square, as representing the end or heel of the lap, and proceed with the spokeshave to cut away the material, from this line down to the end of the belt, the latter becoming the point of the lap. This should be "roughed off"



Scrape off all the old glue

with the spokeshave, and then scraped down to the point with the scraper, and trimmed up with the knife.

A small steel plane also can be used to advantage in connection with the spokeshave. Any man handy with tools soon can learn to make a good lap quickly.



Spread cement, hot and thin, working it well into fibre

The points which must be noted here are:

1. The points of the laps always must be exactly square with the edge of the belt. Guesswork will not do here.
2. The lap must be gradually tapered from heel to point. Avoid a lump back of the point.
3. Take care to remove all the old glue, and to present a clean, fresh surface to the cement.
4. See that the glue is hot, and not

Rubbing down surface to make cement adhere

too heavy; spread thin, working it carefully into the fibers of the leather.

5. Bring the two glued surfaces together, taking care that they do not slip on each other. Rub the joint with a scraper handle to supply a little pressure, or place the joint between two small boards and apply pressure with the bench clamps.
6. Permit the glue to "set" for an hour, before putting the belt on the pulley.

B. C. Riblet, of the Riblet Tramway Co., Spokane, Wash., is in Peru superintending the erection of a new tramway line for the American Smelting & Refining Co., from Singirual to Milluachaqui. The line will be about 35,000 ft. long, with a capacity of 15 tons per hour, and will connect the mine with a new mill which is now being erected. The new line will be of standard Riblet units, with two angles, and be of all-steel and concrete construction.

The Riblet Tramway Co. has also just been awarded the contract to construct a new tramway line in Bolivia for Guggenhehim Bros. This will also be a rope tramway of standard Riblet construction and will be about 30,000 ft. long and have a capacity of 12 tons per hour. It will be used in carrying tin ore from the mines to the mill of the Caracolas Tin Mining Co. of Bolivia. An interesting feature of this line will be the high altitude at which it will be constructed, part of it being 16,000 ft. above sea level.

The largest coal-mining hoist in the world will be installed at Orient No. 2 mine of the Chicago, Wilmington & Franklin Coal Co. at West Frankfort, Ill. A contract for this hoist has been awarded to the Westinghouse Electric & Manufacturing Co. and the Nordberg Manufacturing Co. The hoist will be twice as large as any coal-mining hoist in North America at present. The capacity of the motors will be 4,400 hp. divided in two motors, one mounted at each end of the drum shaft and each having a capacity of 2,200 hp. at 40 deg. C. rise. Skips will be used, each having a normal capacity of 22,000 lb. and a maximum capacity of 26,000 lb. The depth of the shaft is 607 ft. Under normal conditions, the output per hour will be 1,500 tons and under the maximum conditions this can be increased to 2,000 tons. The maximum hoisting speed will be over 4,000 ft. per minute. The entire operation of a single cycle from the time the skip starts until it is in the dumping position will require only sixteen seconds.

The Bucyrus Company, South Milwaukee, Wis., announces the appointment of E. J. Wilkie as northern sales manager to succeed E. R. Weber, resigned. Mr. Wilkie will have general charge of the sale of Bucyrus products in Wisconsin, Minnesota, North and South Dakota, upper peninsula of Michigan and eastern Montana, with headquarters in South Milwaukee, Wis.

O. H. Fairchild has returned to Chicago from New Orleans, where he has just completed a large installation of cracking units of the Dubbs type for the New Orleans Refining Co.

The Portland Cement Association has published a 15-page pamphlet entitled "Concrete Data for Engineers and Architects." It will be sent free.

The Osgood Company, Marion, Ohio, manufacturers of steam shovels, have added another unit to their line of revolving steam shovels in the new 1¼-yd. heavy duty shovel which is now ready for the market. In this are incorporated such features as horizontal hoisting engines; submerged tube-type vertical boiler; centering gudgeon for connecting main body casting to path gear; simplified continuous tread mounting; power steering on both continuous tread and traction mounting; double-geared shipper shaft; automatic trip rope tension, and others. The hoisting, swinging and crowding engines are of ample size and stroke to furnish a surplus of power for all ordinary uses. The entire machine is designed for heavy work.

TRADE CATALOGS

Blowers—The Connecticut Blower Co., Inc., of Hartford, Conn., has issued a thirteen-page catalog describing the Keeney adjustable, interchangeable and reversible exhaust fans. In the designs shown the housing, bearing standard, inlet and cone are made of sheet steel, this design being known as the Allsteel indestructible fan.

Belt Loaders—A folder received from the Ottumwa Box Car Loader Co., Ottumwa, Iowa, contains a description of the Ottumwa portable belt loader for loading sand and gravel, crushed rock, salt, lime, ores and concentrates, phosphate and other materials into box cars.

Samplers—The Galigher Machinery Co., of Salt Lake City, Utah, has issued a four-page folder describing its Auto Sampler No. 2 for taking wet or dry samples in ore treatment and industrial plants.

Track Shifters—The Lake Superior Loader Co. has just placed the Peterson patented track shifter on the market. This is described in a four-page folder, in which the design and operation of the device is well illustrated.

Cranes—The Byers Machine Co., Ravenna, Ohio, manufacturers of cranes and hoisting equipment, have issued a sixteen-page catalog describing the company's line of Truckranes. In these the entire excavating unit is mounted on a motor truck.

Pumps—The De Laval Steam Turbine Co., of Trenton, N. J., describes a new multistage centrifugal pump of the series type in a twenty-page catalog just issued.

Preheaters—Bulletin A-5 of James Howden & Co. of America, 114 Liberty St., New York, is devoted to a description of the Howden-Ljungström air preheater. Arrangements have been effected whereby these preheaters can be made at the company's plant at Wellsville, N. Y., and sold for stationary purposes throughout the United States.

Conveyor Idlers—Engineer's Bulletin No. 4 of the Chillingworth Engineering Corporation, 143 Liberty St., New York, describes the Mellin troughing and return idler. This idler is equipped with Alemite high-pressure lubricating fittings and Hyatt roller bearings, each bearing being mounted in a self-aligning bearing box entirely surrounded by grease. Data required for selecting size of belt and horsepower of drives and other like information are included.

Hoists—The Denver Rock Drill Manufacturing Co., Denver, Colo., has issued a eight-page folder describing its new Model 300 Turbo Waughoist. This is primarily a scraper hoist and fully meets the conditions encountered in slusher mining, it is claimed. It is equipped with safety devices and has automatic lubrication.